

1/55

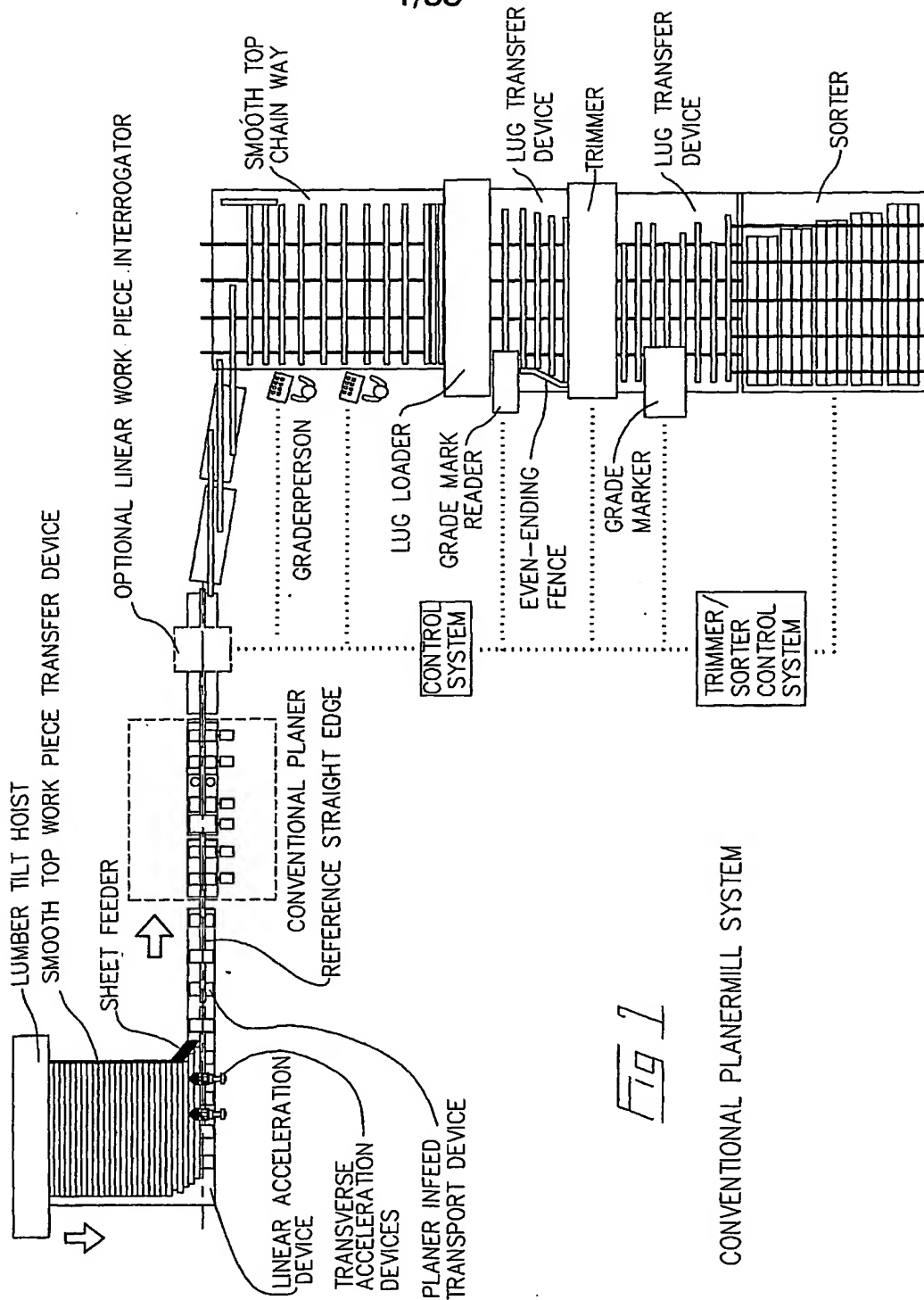
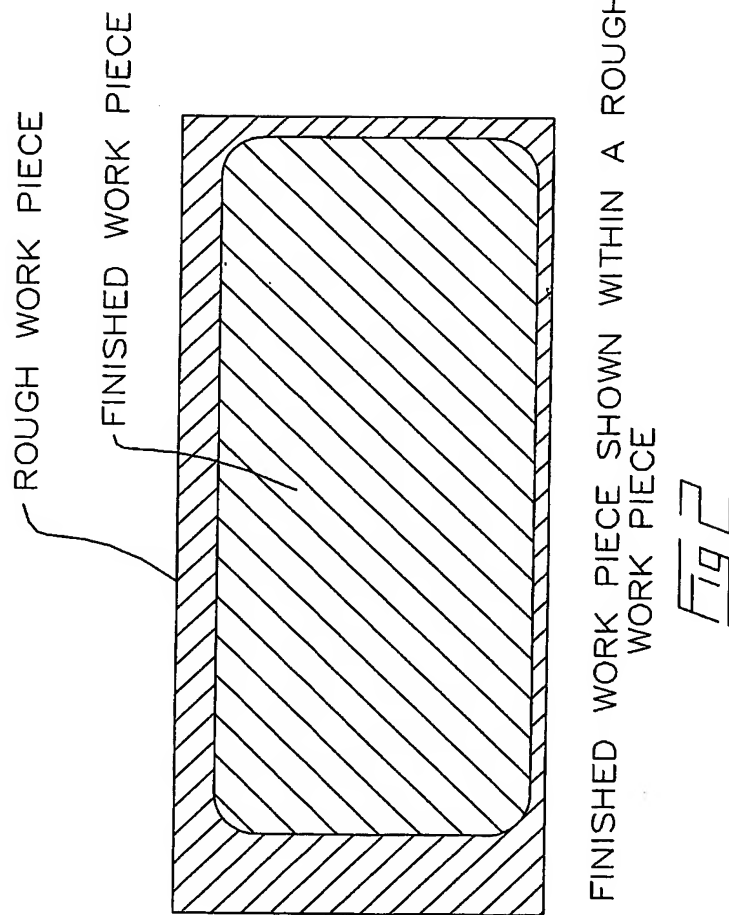
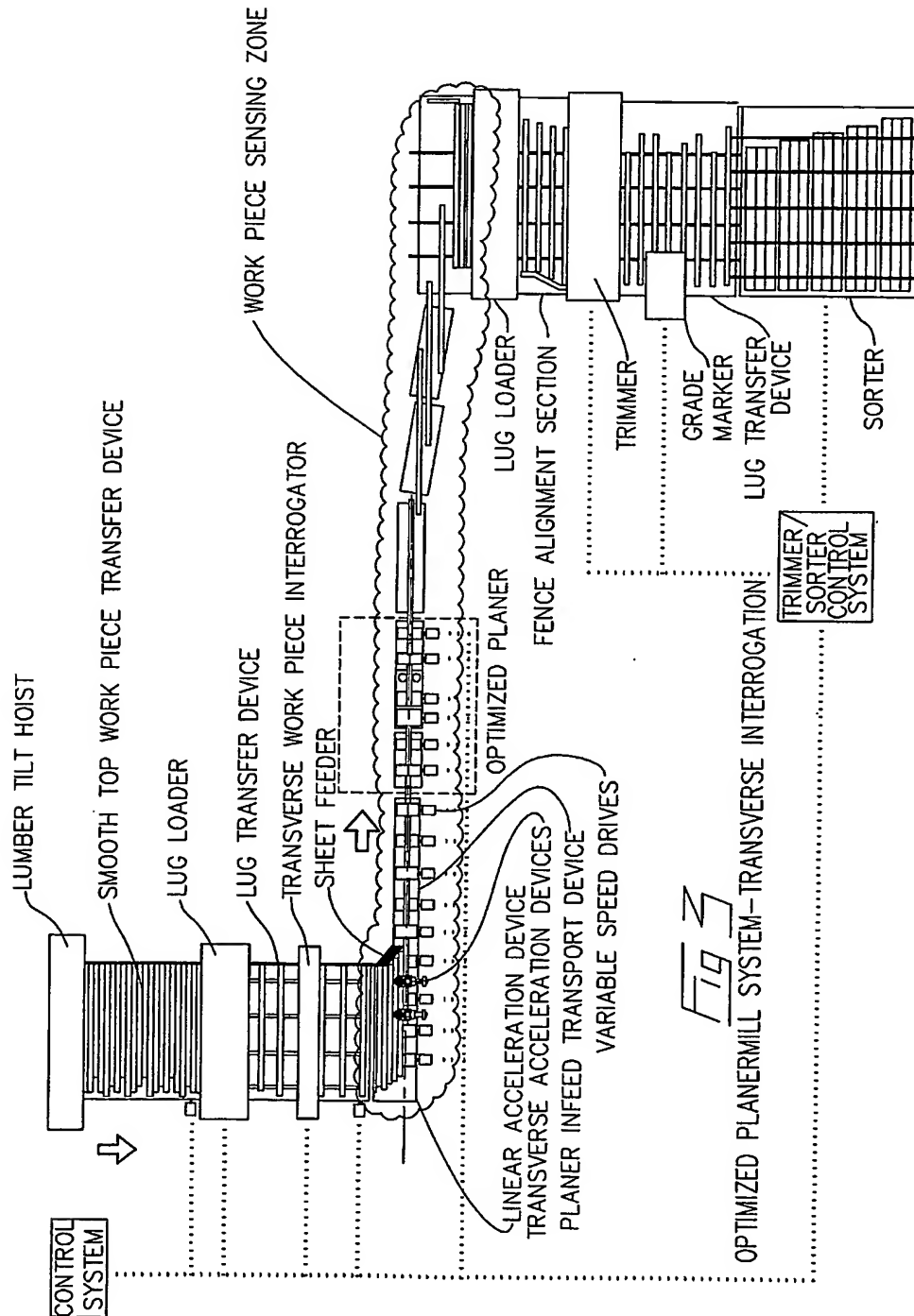


Fig 1

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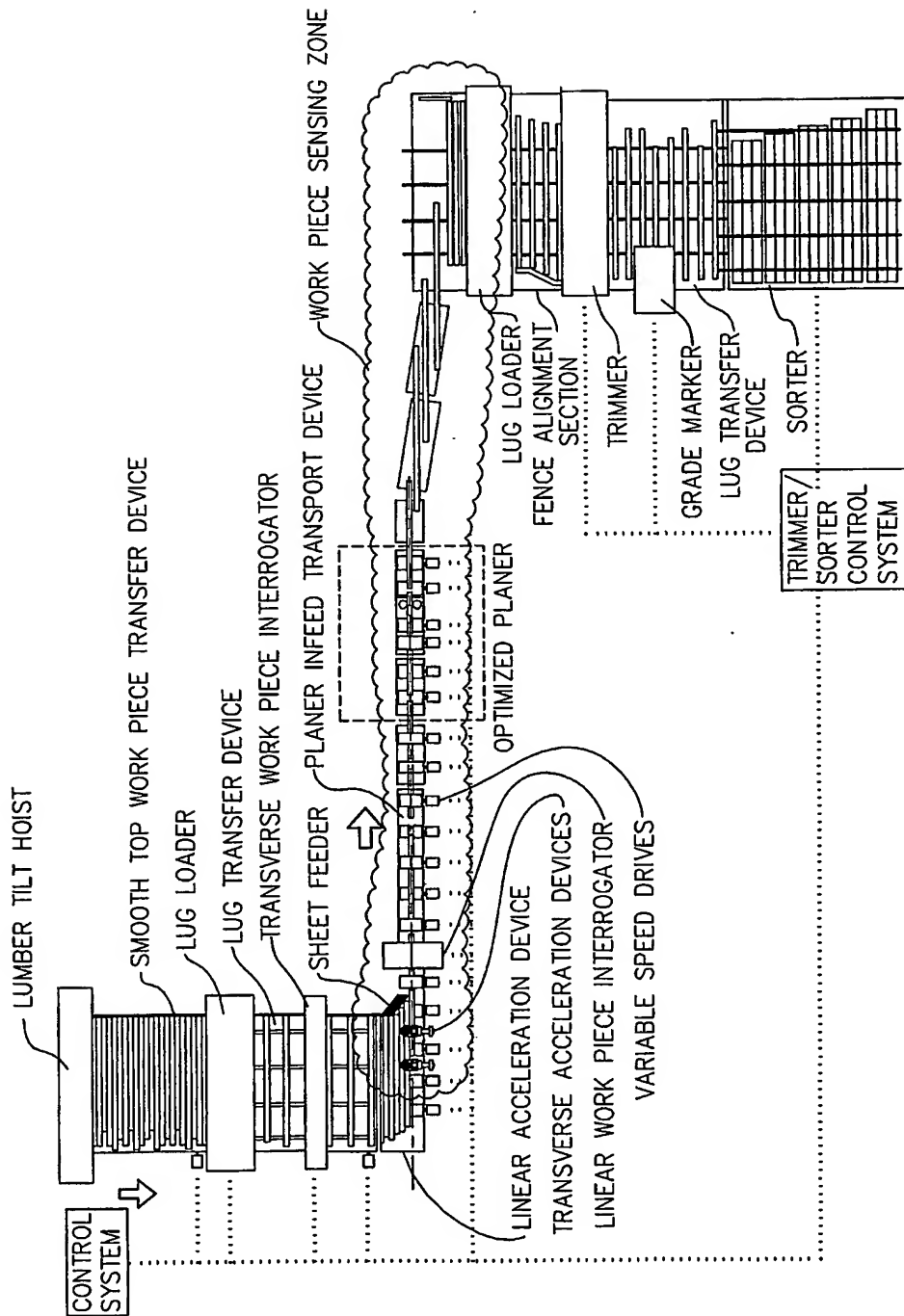


Fig 4

OPTIMIZED PLANERMILL SYSTEM—TRANSVERSE AND LINEAR INTERROGATION

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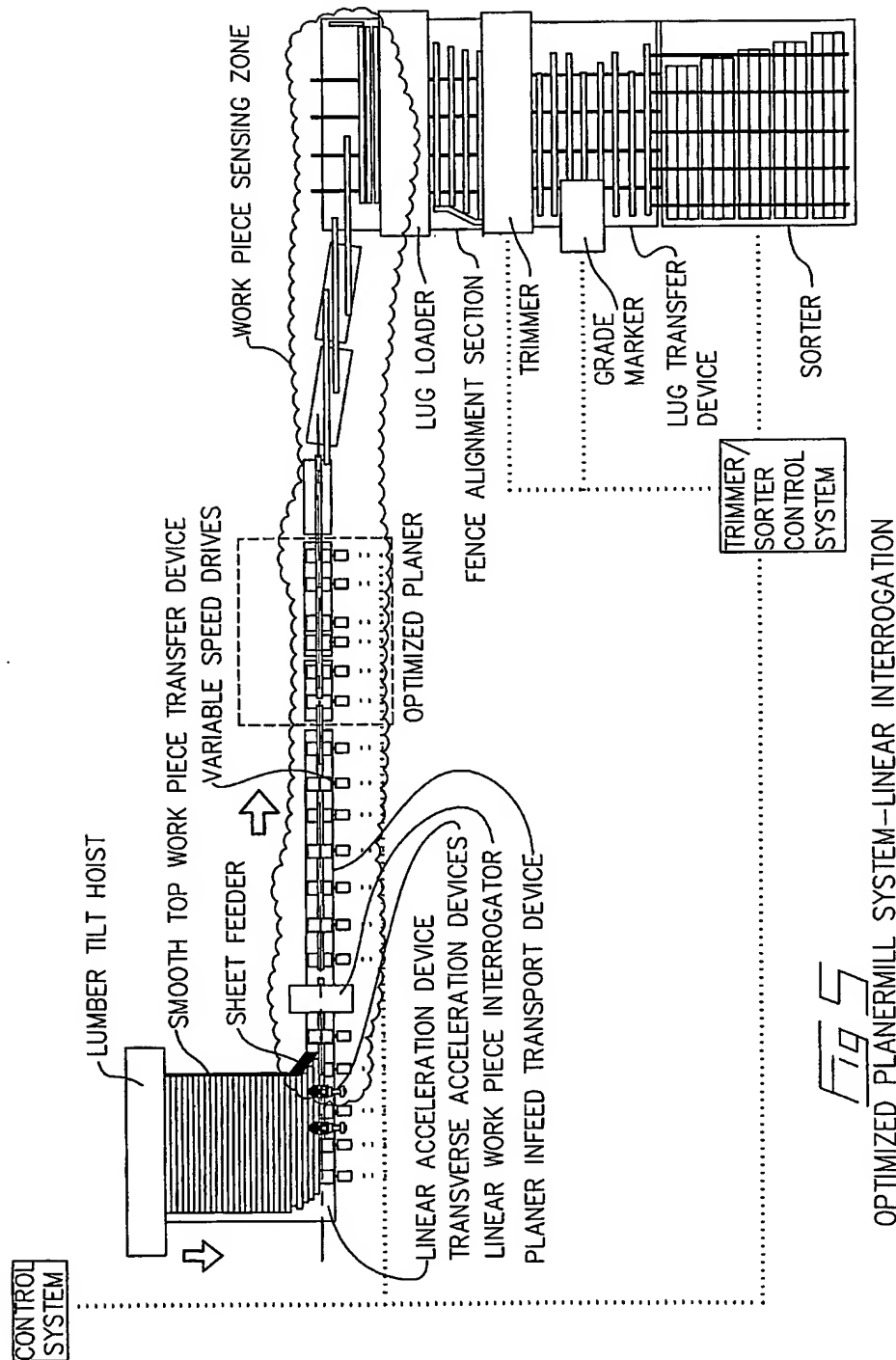


Fig 5

OPTIMIZED PLANERMILL SYSTEM—LINEAR INTERROGATION

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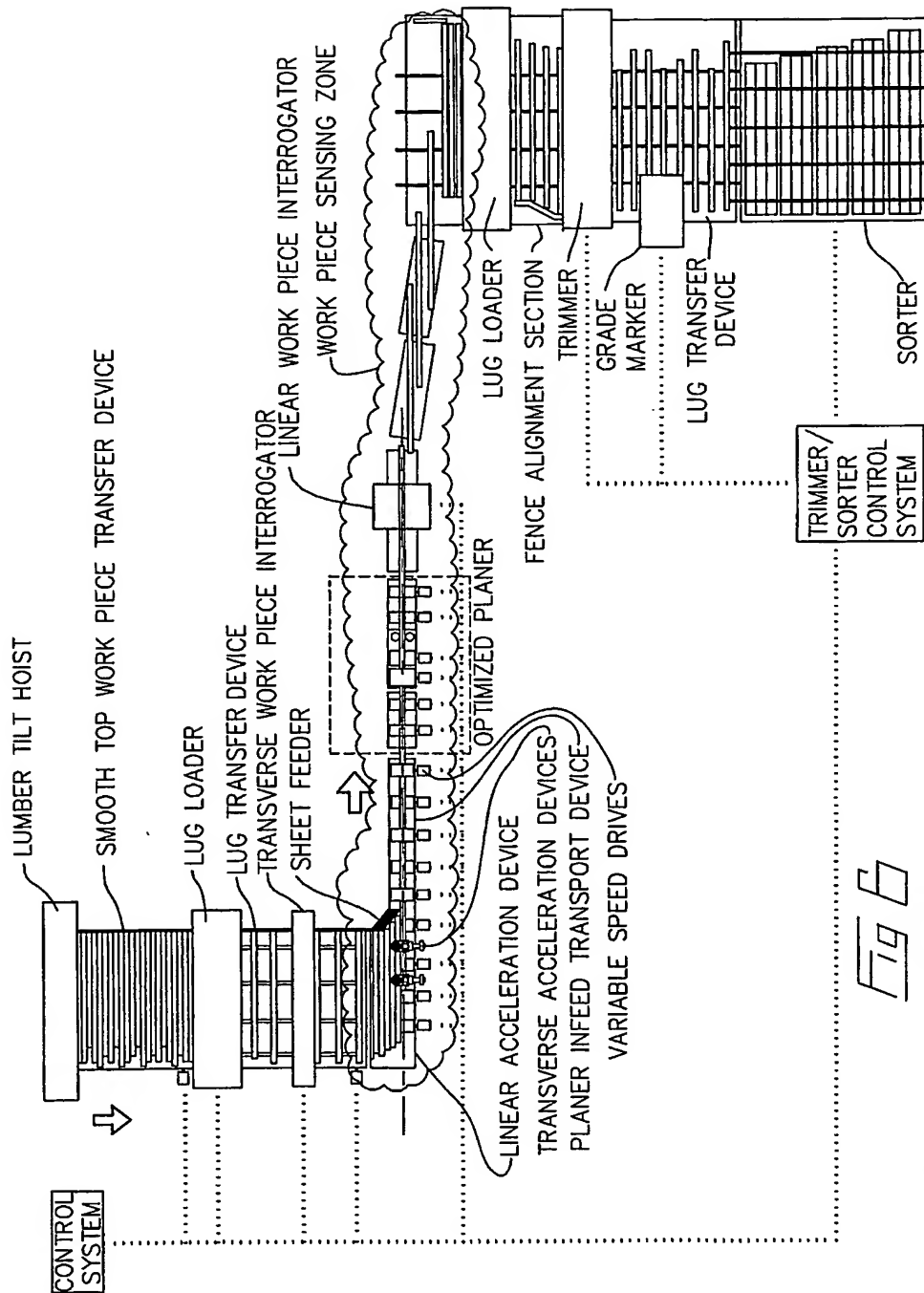


Fig 6

OPTIMIZED PLANERMILL SYSTEM—TRANSVERSE INTERROGATION
(WITH POST PLANER INTERROGATION)

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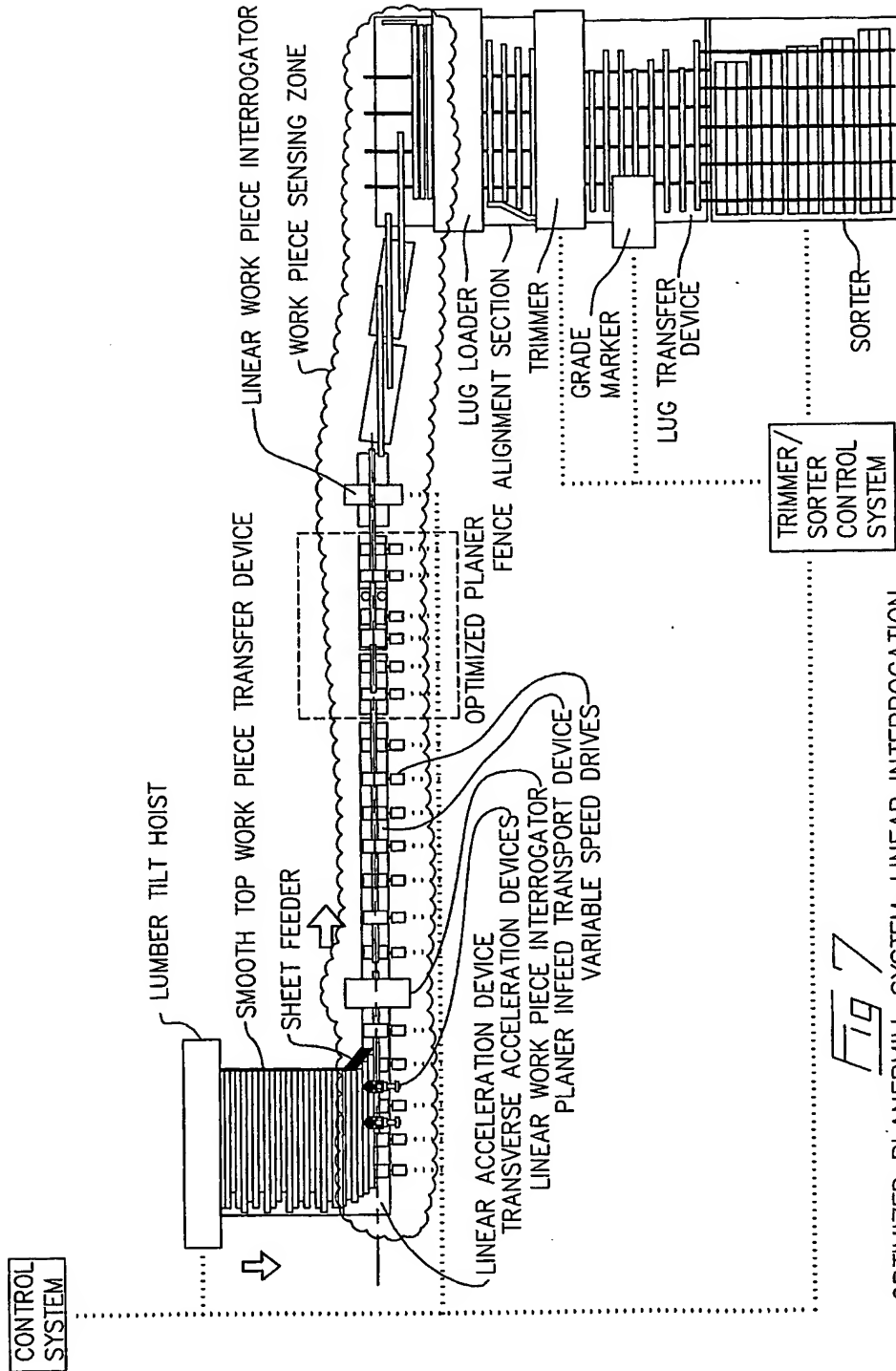


Fig 7

OPTIMIZED PLANERMILL SYSTEM—LINEAR INTERROGATION
(WITH POST PLANER INTERROGATION)

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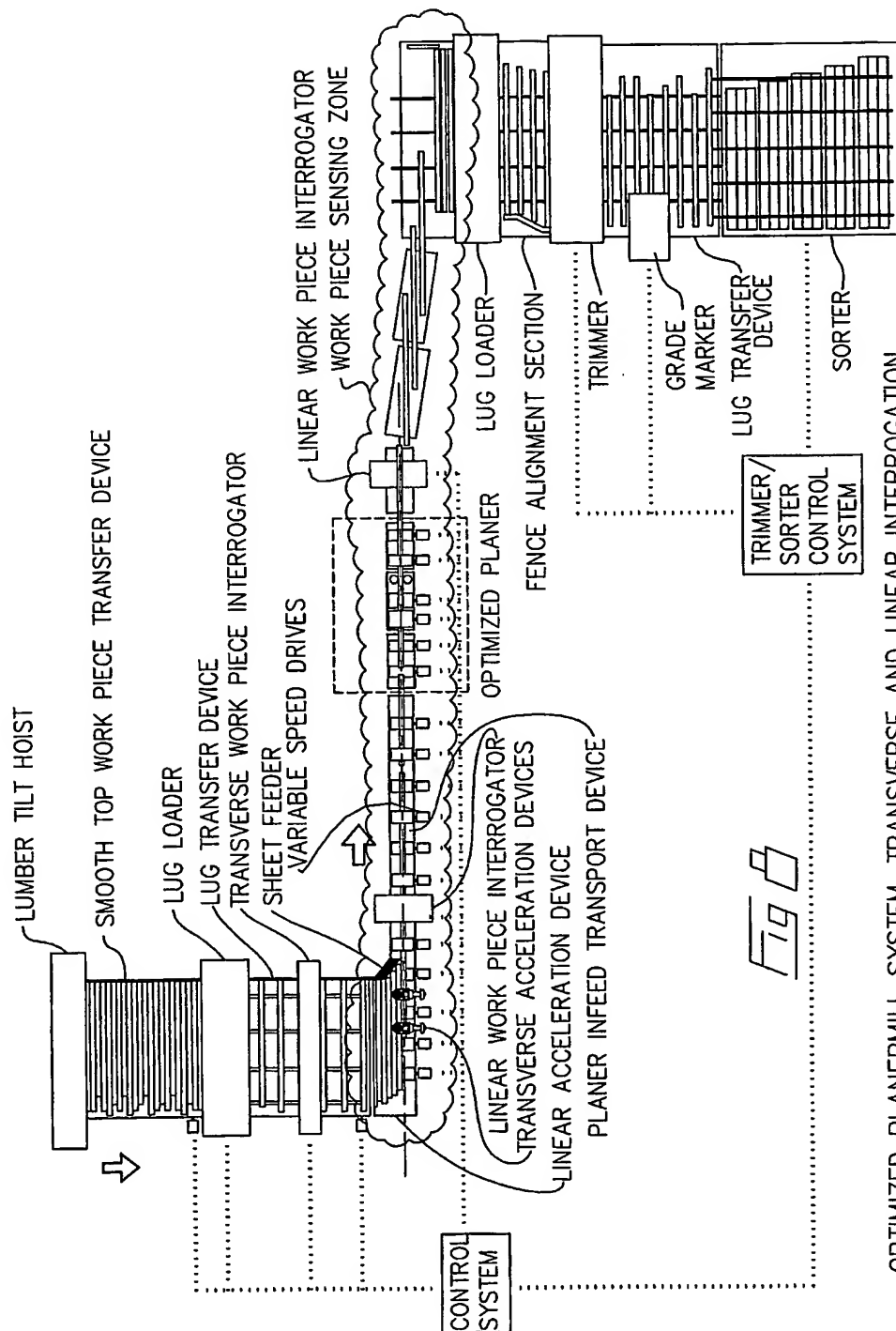


Fig 8

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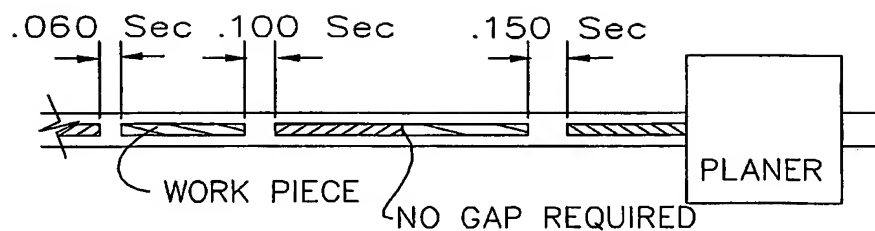


Fig 9

SIMPLIFIED EXAMPLE OF FULLY OPTIMIZED GAP CONTROL

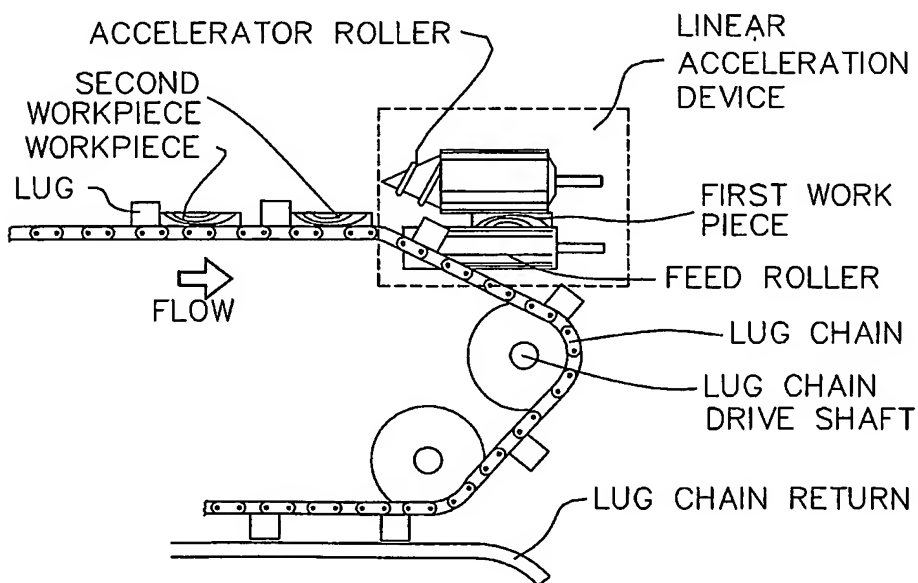
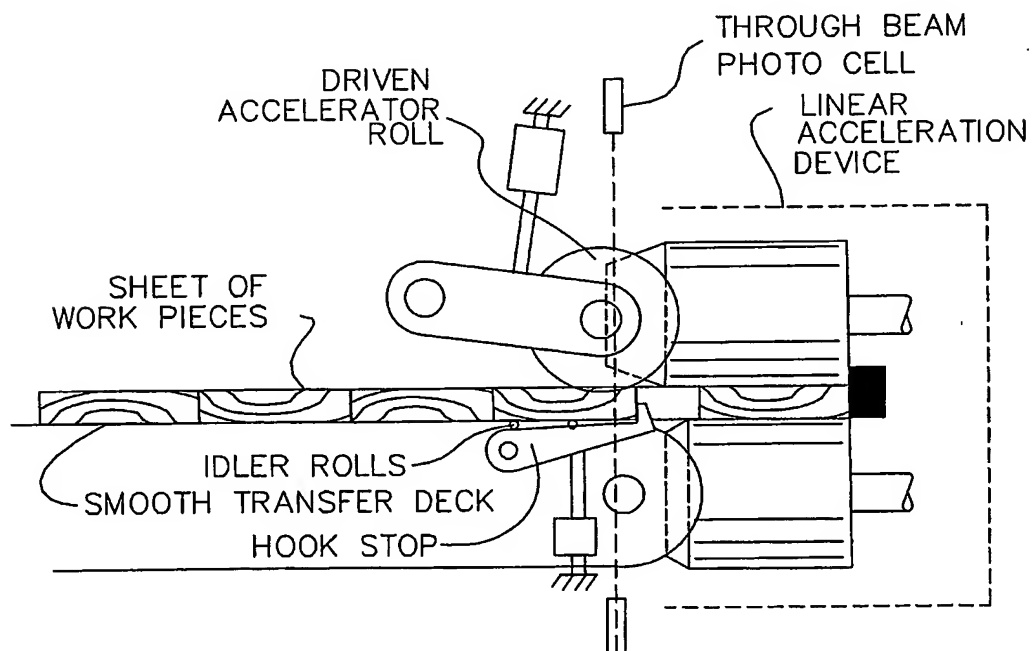
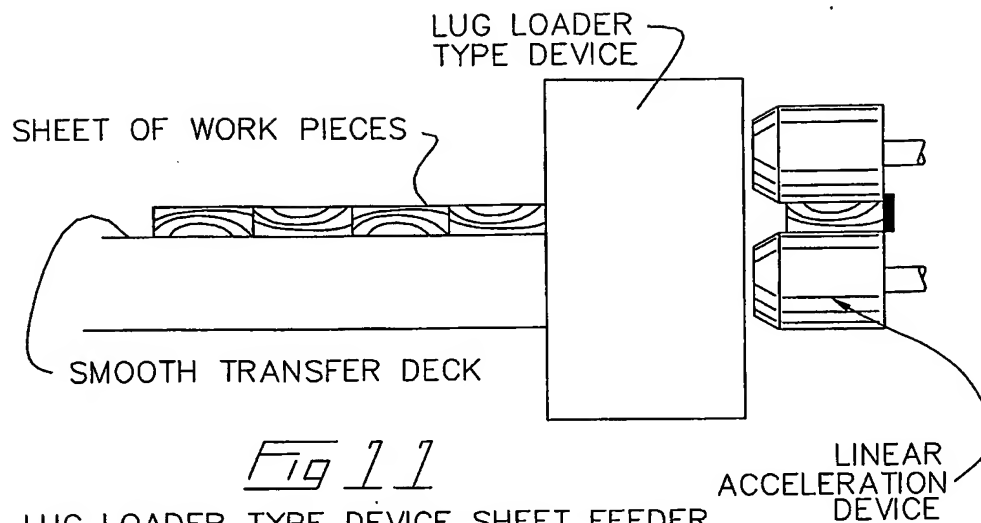


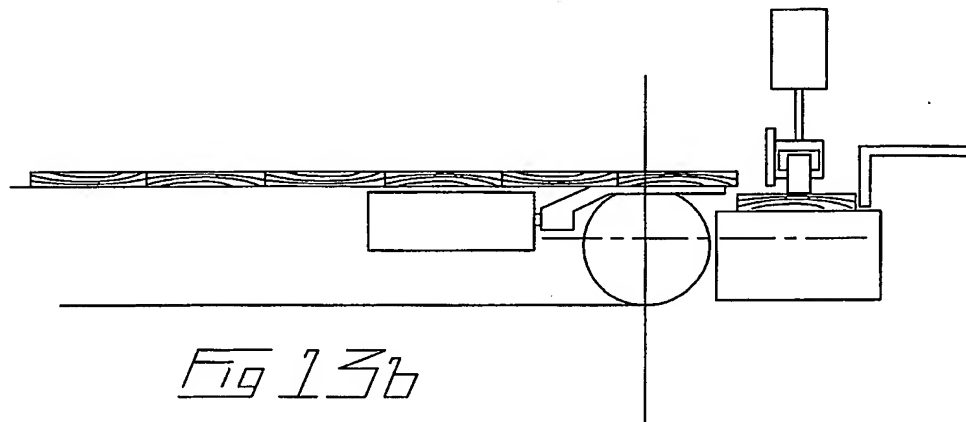
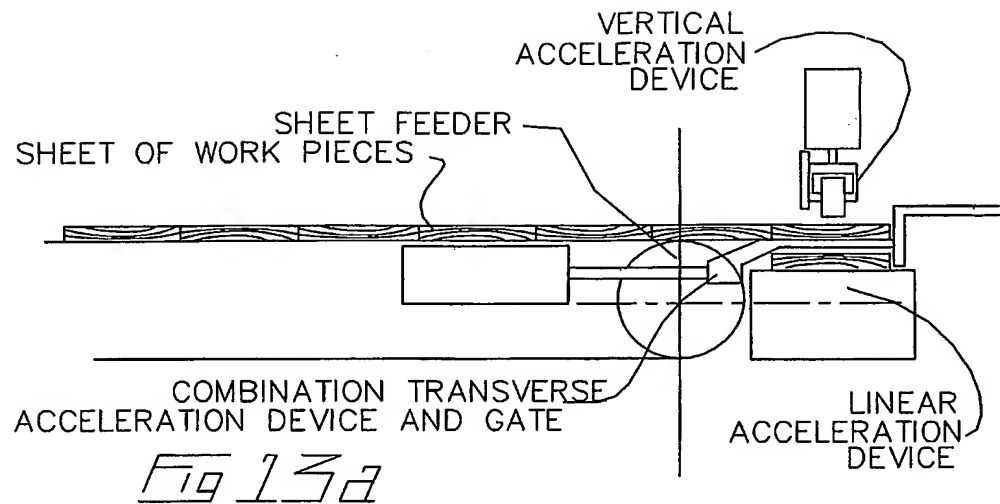
Fig 10

LUG TRANSFER DEVICE FEEDING WORKPIECES
WITH A LINEAR ACCELERATION DEVICE

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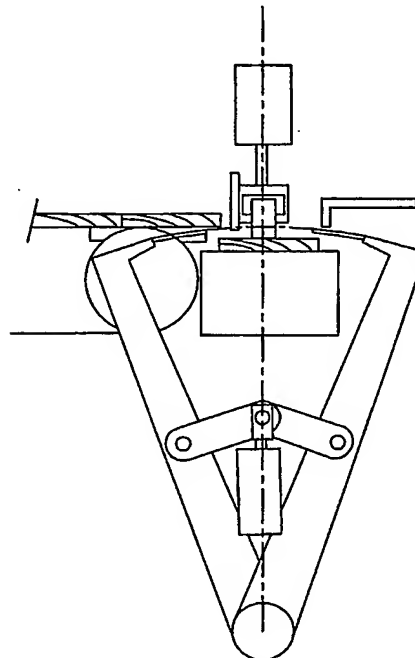
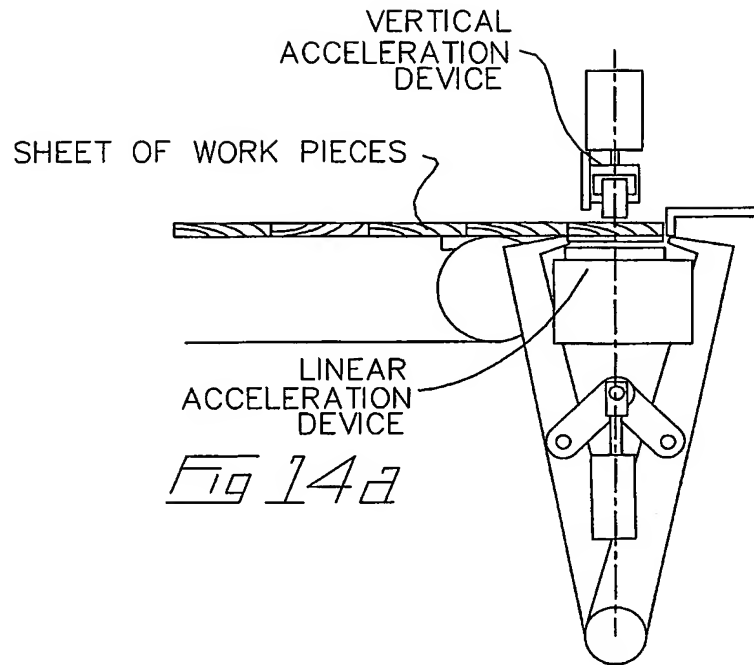


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SHEET FED TRANSVERSE ACCELERATION DEVICE COMBINED WITH
VERTICAL ACCELERATION DEVICE AND LINEAR ACCELERATION DEVICE

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ALTERNATE SHEET FED VERTICAL ACCELERATION

13/55

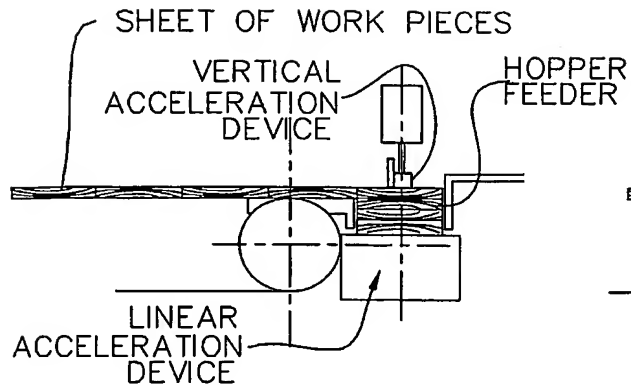


Fig 15a

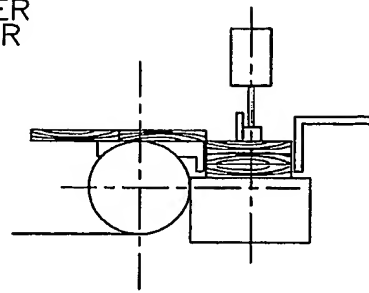


Fig 15b

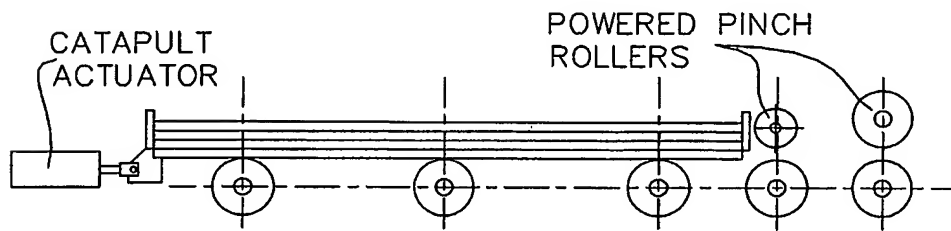


Fig 15c

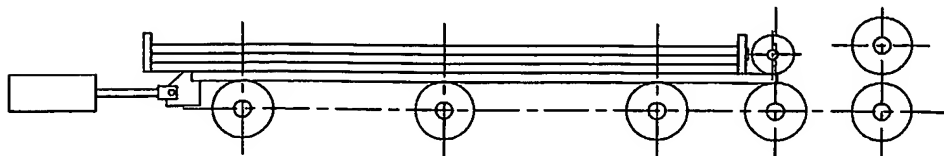
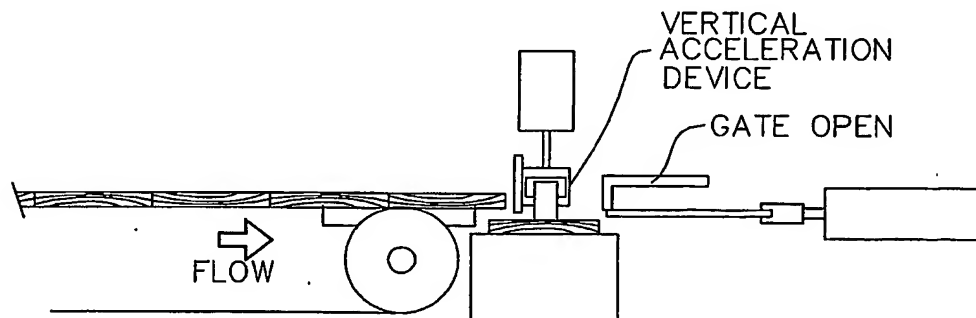
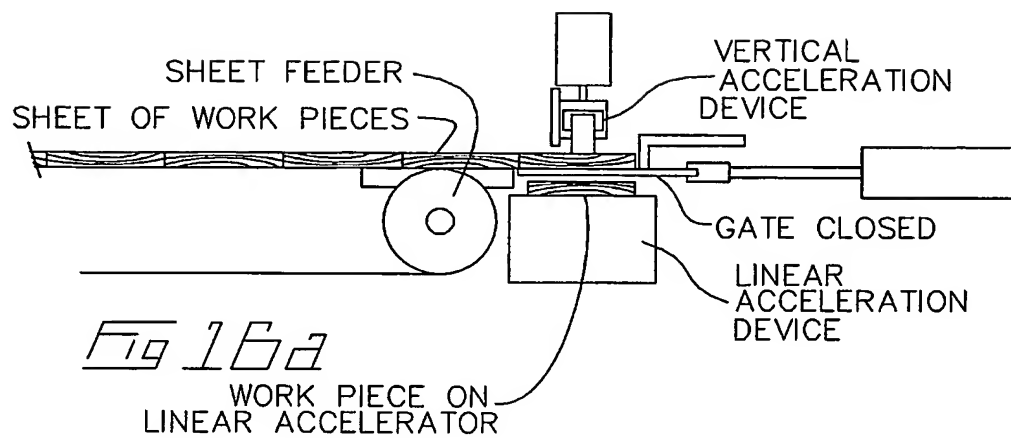


Fig 15d

SHEET FED HOPPER FEEDER DEVICE

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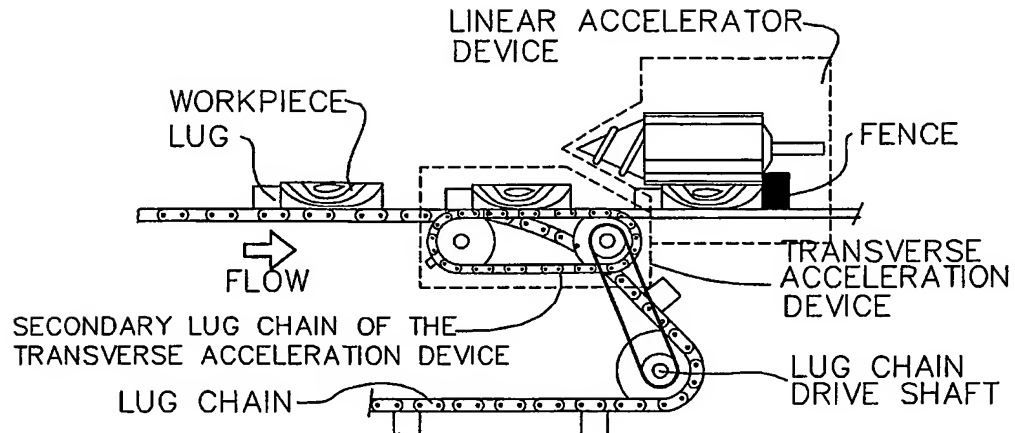


Fig 17

TRANSVERSE ACCELERATION DEVICE
FEEDING LINEAR ACCELERATION DEVICE

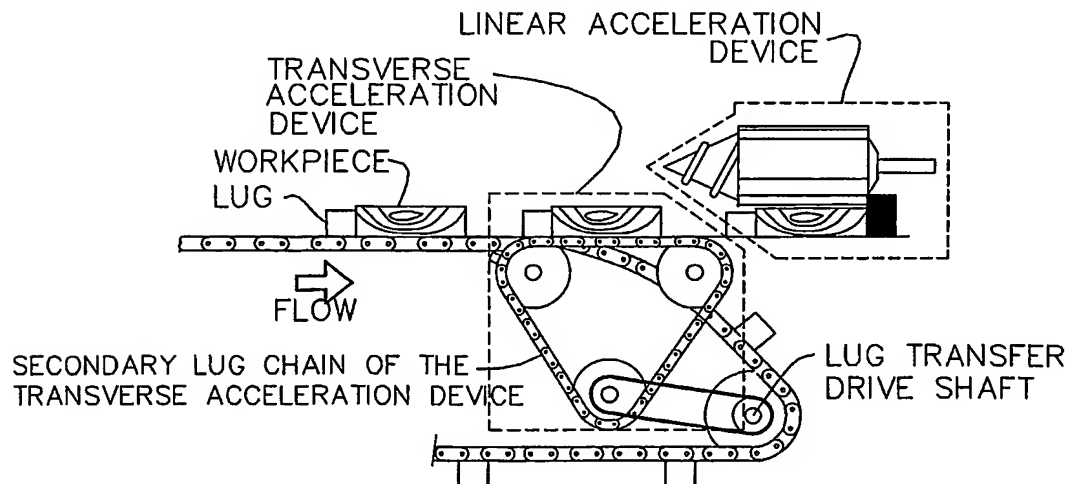


Fig 18

TRANSVERSE ACCELERATION DEVICE
FEEDING LINEAR ACCELERATION DEVICE

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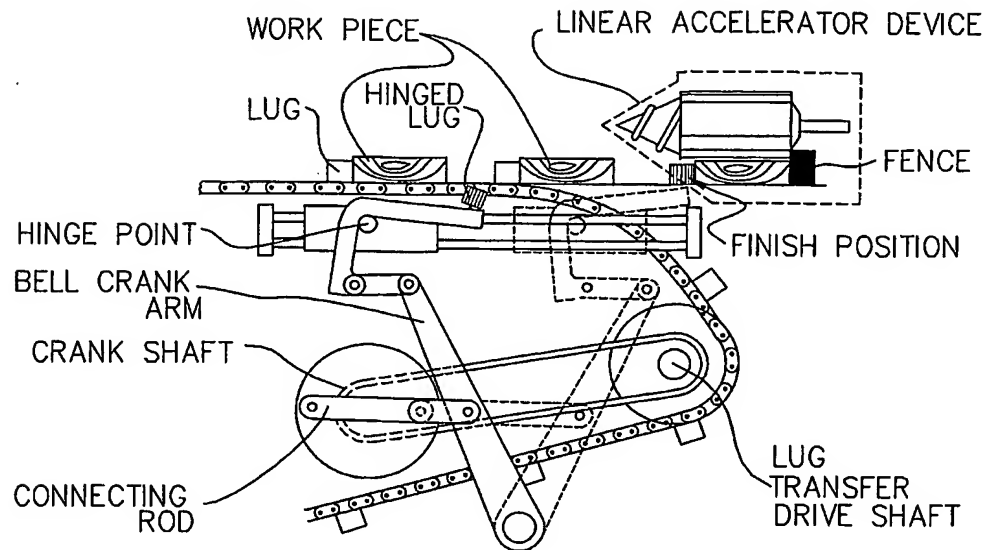


Fig 19
TRANSVERSE ACCELERATION DEVICE
SLIDER CRANK TYPE

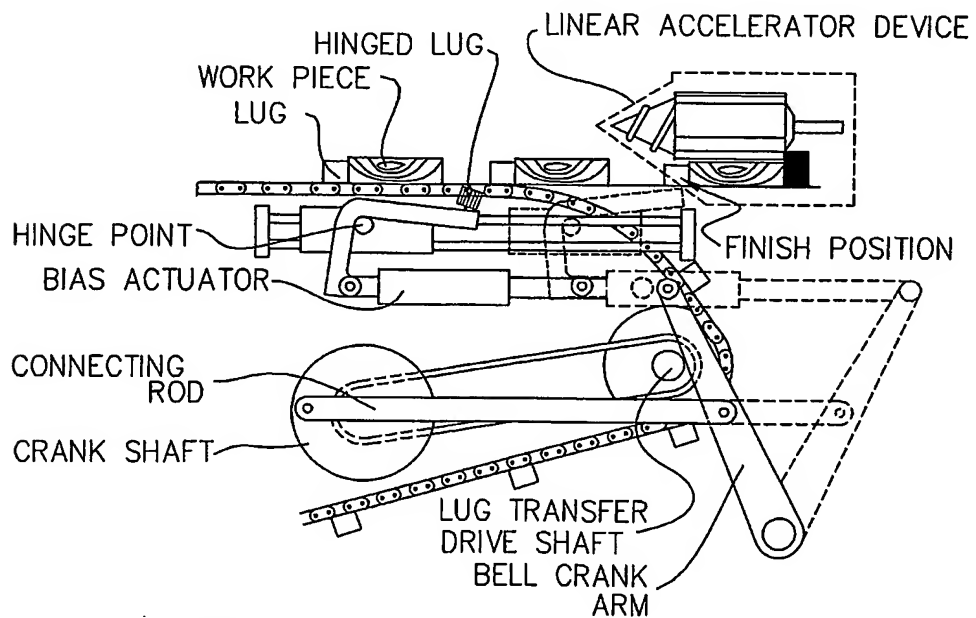
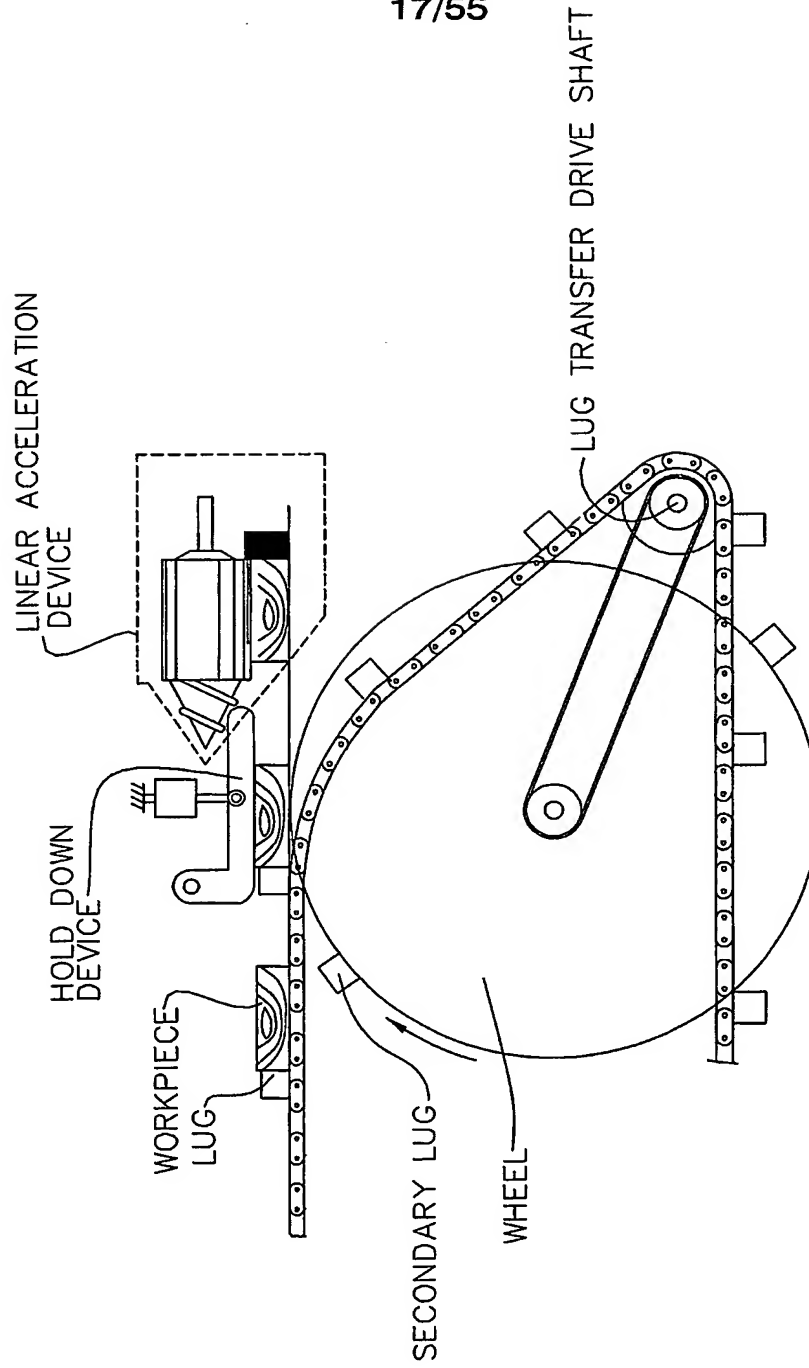


Fig 20
TRANSVERSE ACCELERATION DEVICE

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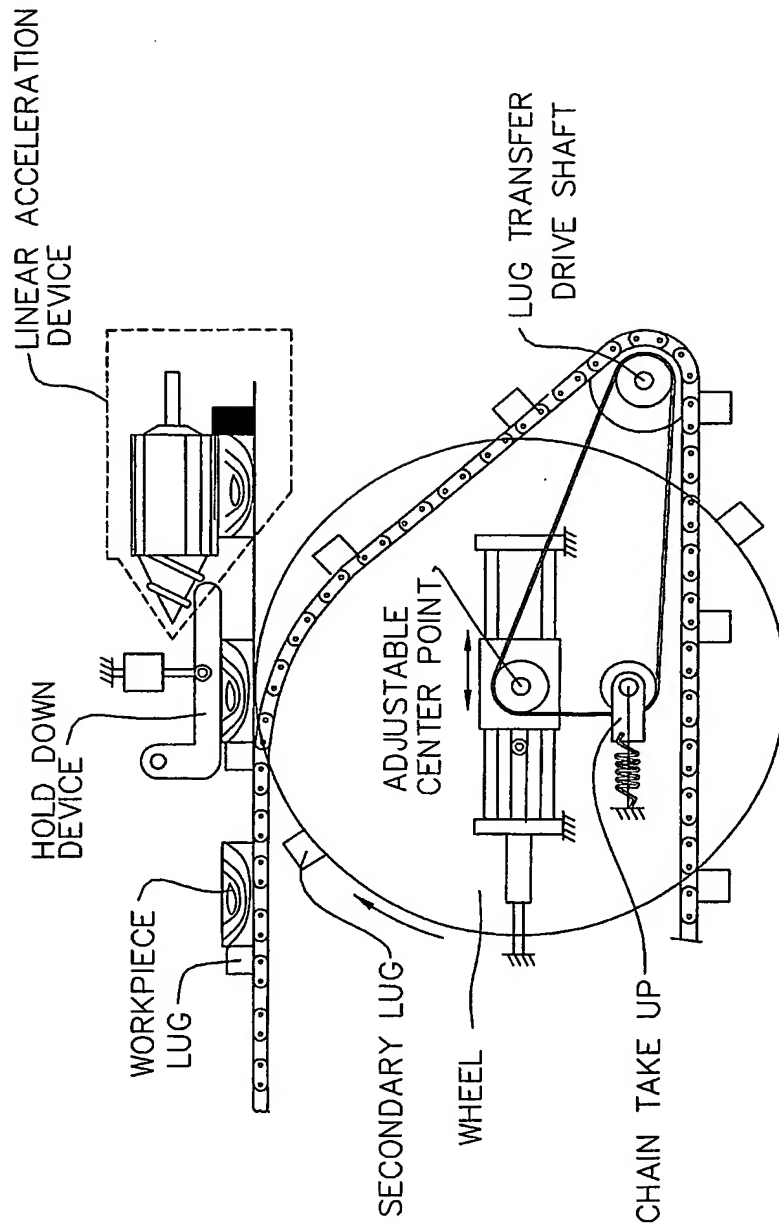


Fig 22

TRANSVERSE ACCELERATION DEVICE

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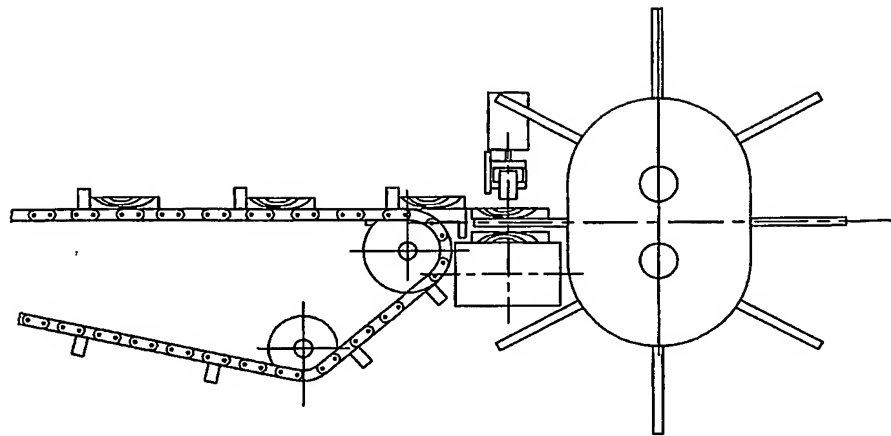


Fig 23a

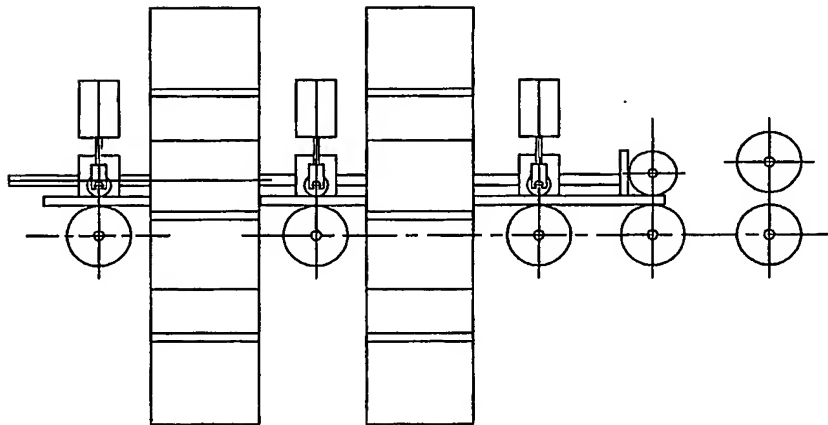


Fig 23b

CONTINUOUS INDEXIBLE SUPPORT ARM
VERTICAL ACCELERATION DEVICE

20/55

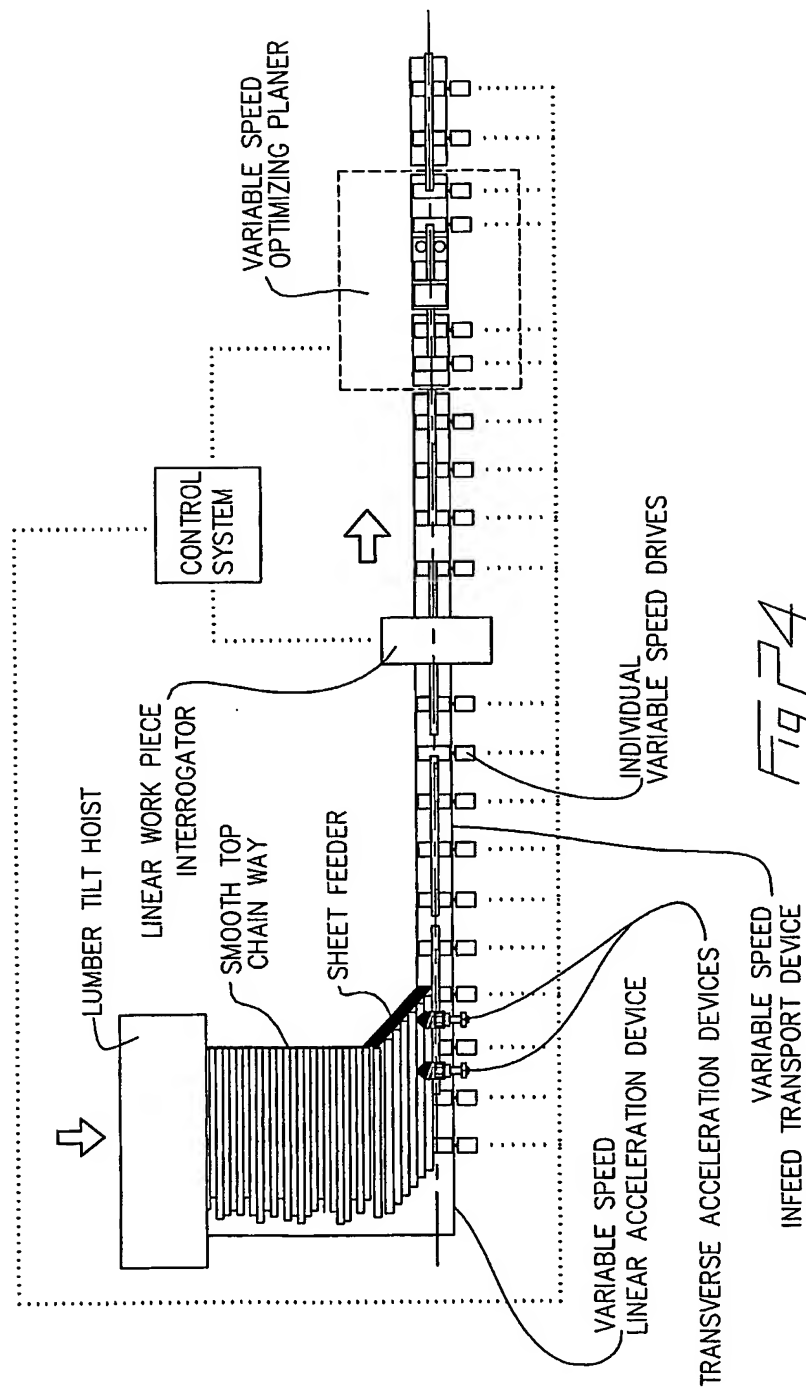


Fig 24

VARIABLE SPEED INFEED TRANSPORT DEVICE WITH A SHEET FED LINEAR ACCELERATOR DEVICE AND A LINEAR WORK PIECE INTERROGATOR

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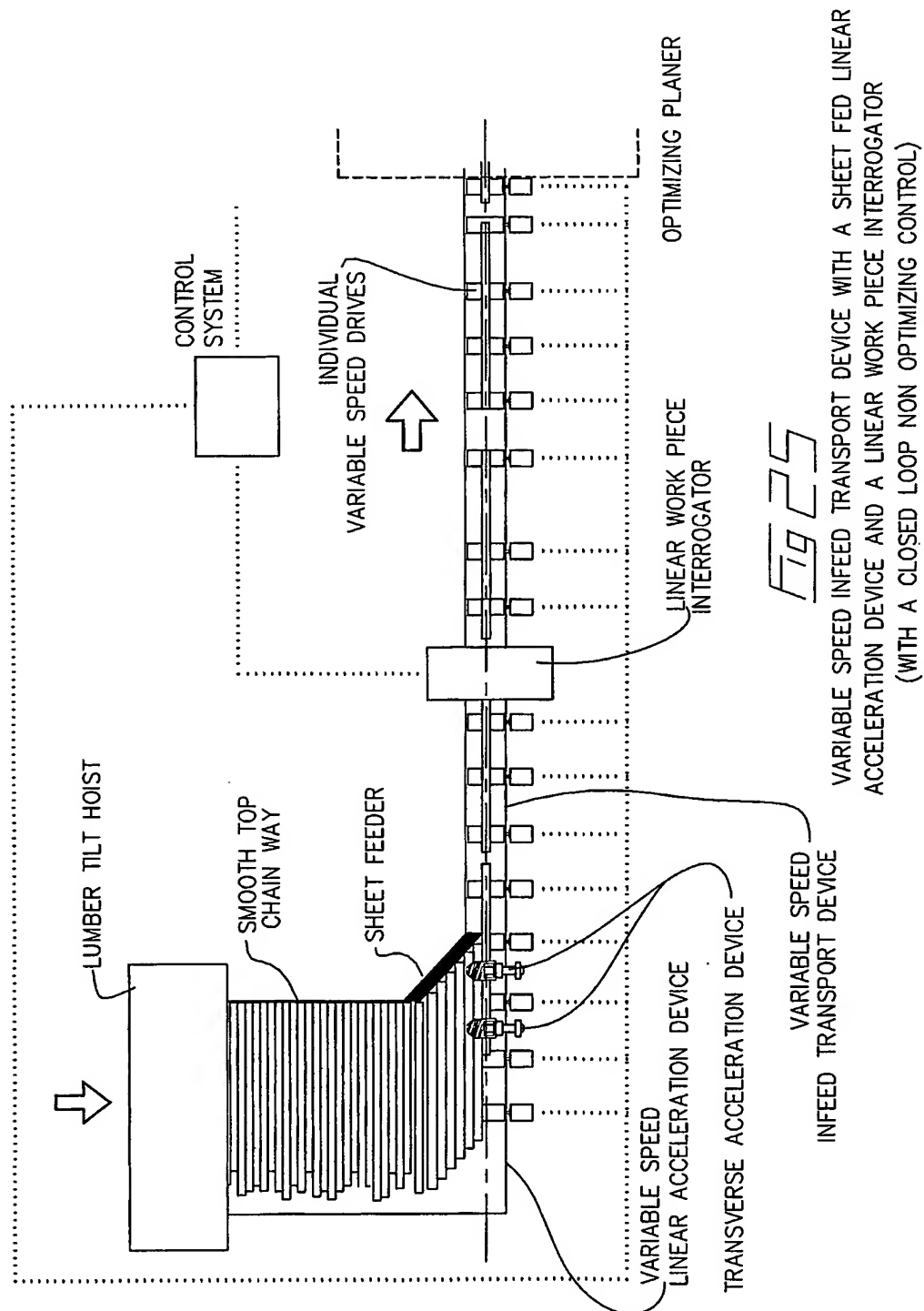


Fig 25

VARIABLE SPEED INFEED TRANSPORT DEVICE WITH A SHEET FED LINEAR ACCELERATION DEVICE AND A LINEAR WORK PIECE INTERROGATOR (WITH A CLOSED LOOP NON OPTIMIZING CONTROL)

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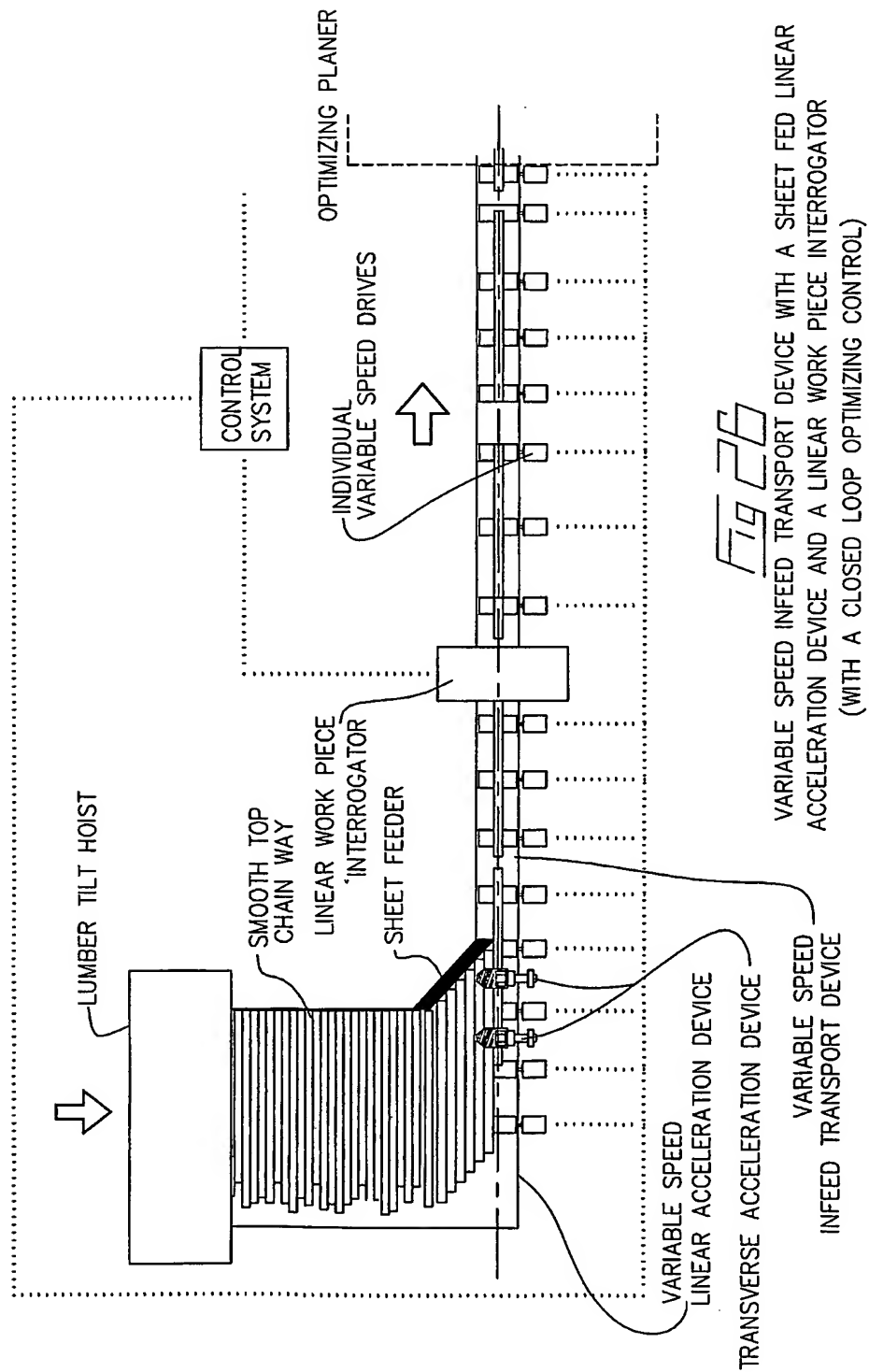


Fig 26

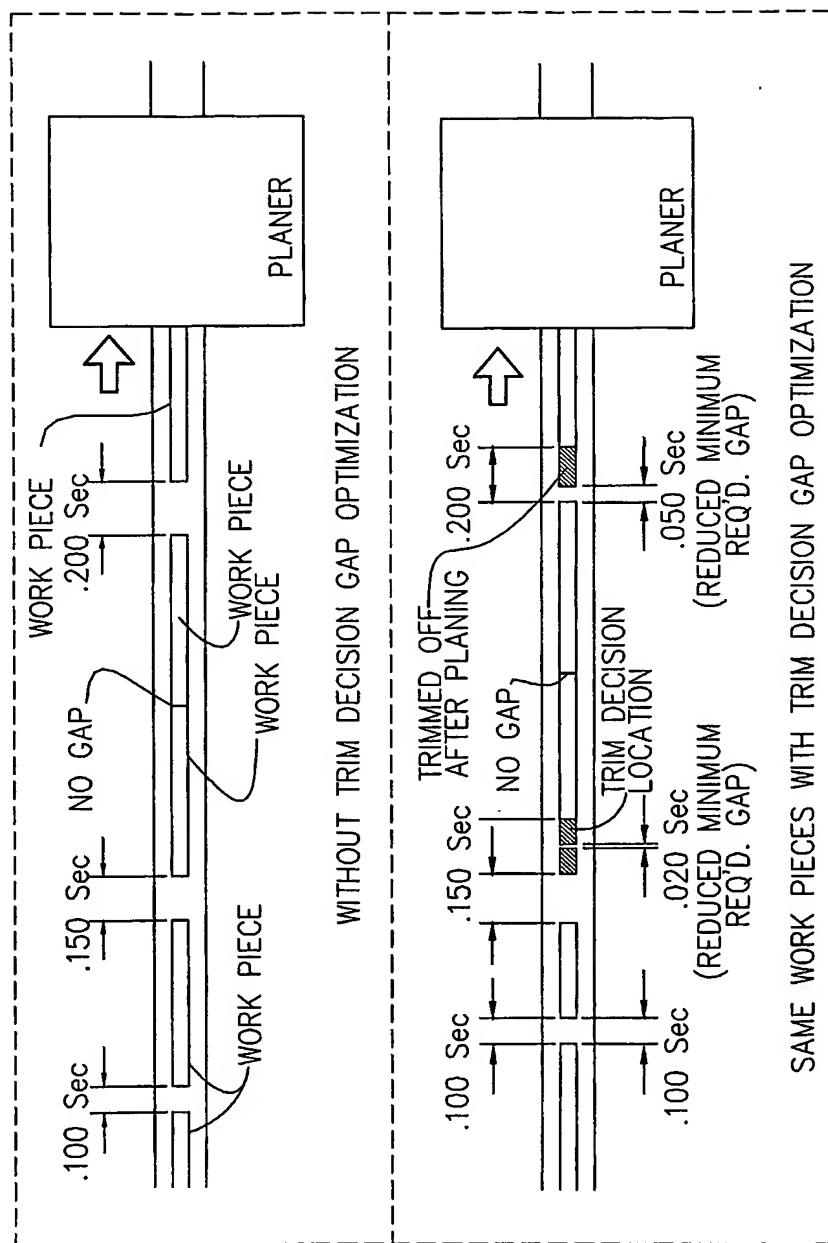


Fig 27

EXAMPLE OF FULLY OPTIMIZED GAP CONTROL
(WITH AND WITHOUT THE ADDITION OF TRIM DECISION GAP OPTIMIZATION)

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		SHEET FEEDER	FIXED SPEED LUG TRANSFER	VARIABLE SPEED LUG TRANSFER	FIXED SPEED TAD	VARIABLE SPEED TAD	VERTICAL AD	FIXED SPEED LAD	VARIABLE SPEED LAD	FIXED SPEED ITD	VARIABLE SPEED ITD	FIXED SPEED PLANNER	VARIABLE SPEED PLANNER	LINEAR WPI	TRANSVERSE WPI	WPS	OLNO	CLNO	CLO
1	A	X																	
2	X	X						X		X		X		X		X		X	
3	X	X						X		X		X		X		X		X	
4	X	X						X		X		X		X		X		X	
5	X	X						X		X		X		X		X		X	
6	X	X							X	X		X		X		X		X	
7	X	X							X	X		X		X		X		X	
8	X	X							X	X		X		X		X		X	
9	X	X							X	X		X		X		X		X	
10	X	X							X	X		X		X		X		X	
11	X	X							X	X		X		X		X		X	
12	X	X							X	X		X		X		X		X	
13	X	X							X	X		X		X		X		X	
14	X	X					X	X		X		X		X		X	X		
15	X	X					X	X		X		X		X		X		X	
16	X	X					X	X		X		X		X		X		X	
17	X	X					X	X		X		X		X		X		X	
18	X	X					X	X		X		X		X		X		X	
19	X	X					X	X	X	X		X		X		X		X	
20	X	X					X	X	X	X		X		X		X		X	
21	X	X					X	X	X	X		X		X		X		X	
22	X	X					X	X	X	X		X		X		X		X	
23	X	X	X					X		X		X			X		X		
24	X	X	X					X		X		X			X		X		
25	X	X	X					X		X		X		X		X		X	
26	X	X	X					X		X		X		X		X		X	
27	X	X	X					X		X		X		X		X		X	
28		X	X					X		X		X		X		X		X	
29		X	X					X		X		X		X		X		X	
30		X	X		X			X		X		X		X		X		X	
31		X	X		X			X		X		X		X		X		X	
32		X	X		X			X		X		X		X		X		X	
33		X	X		X			X		X		X		X		X		X	
34			X					X		X		X		X		X		X	
35			X					X		X		X		X		X		X	
36			X		X			X		X		X		X		X		X	
37			X		X			X		X		X		X		X		X	
38			X			X		X		X		X		X		X		X	
39			X			X		X		X		X		X		X		X	
40			X						X			X		X		X		X	
41			X						X			X		X		X		X	
42			X					X		X		X		X		X		X	
43			X					X		X		X		X		X		X	
44			X					X		X		X	X	X	X	X	X	X	

Fig 20

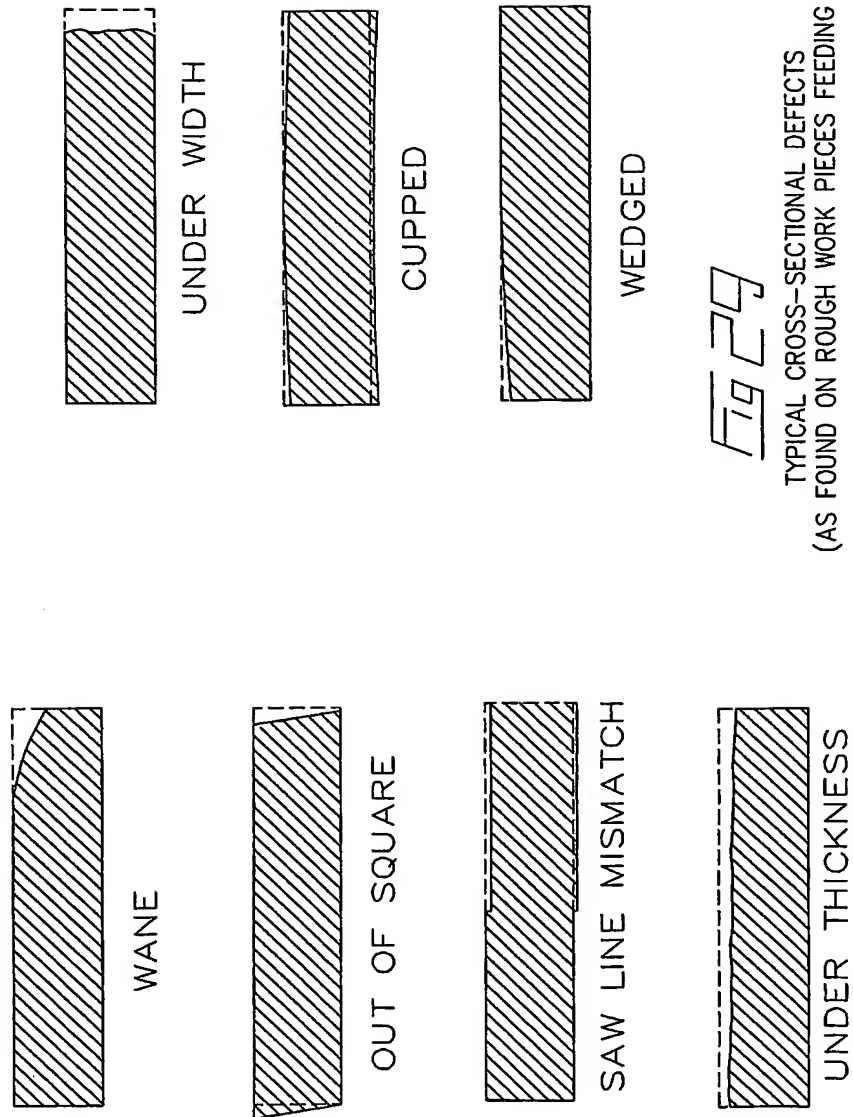
25/55

CONTINUATION OF

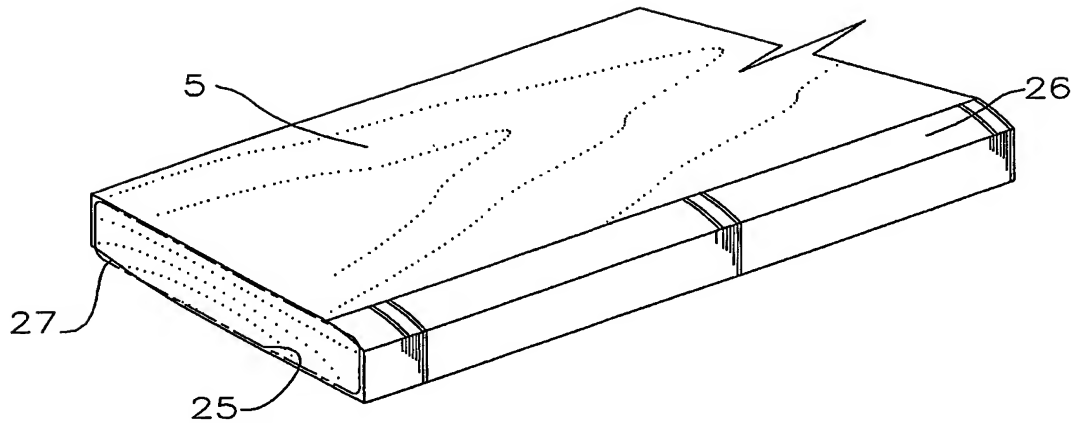
Fig 28

	SHEET FEEDER	FIXED SPEED LUG TRANSFER	VARIABLE SPEED LUG TRANSFER	FIXED SPEED TAD	VARIABLE SPEED TAD	VERTICAL AD	FIXED SPEED LAD	VARIABLE SPEED LAD	FIXED SPEED ITD	VARIABLE SPEED ITD	FIXED SPEED PLANER	VARIABLE SPEED PLANER	LINEAR WPI	TRANSVERSE WPI	WPS	OLNO	CLNO	CLO
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
45			X	X			X	X	X	X	X	X		X	X		X	X
46			X	X				X	X	X	X	X		X	X		X	X
47			X	X				X	X	X	X	X		X	X		X	X
48			X	X				X	X	X	X	X		X	X		X	X
49			X	X				X	X	X	X	X		X	X		X	X
50			X	X				X	X	X	X	X		X	X		X	X
51			X	X				X	X	X	X	X		X	X		X	X
52			X	X		X		X	X	X	X	X		X	X		X	X
53			X	X		X		X	X	X	X	X		X	X		X	X
54			X	X		X		X	X	X	X	X		X	X		X	X
55			X	X		X		X	X	X	X	X		X	X		X	X
56			X	X		X		X	X	X	X	X		X	X		X	X
57			X	X		X		X	X	X	X	X		X	X		X	X
58			X	X		X		X	X	X	X	X		X	X		X	X
59			X	X		X		X	X	X	X	X		X	X		X	X
60		X				X	X		X	X	X	X		X	X	X		
61		X				X	X		X	X	X	X		X	X	X		
62		X				X	X		X	X	X	X		X	X	X		
63		X				X	X	X	X	X	X	X		X	X		X	
64		X				X	X	X	X	X	X	X		X	X		X	X
65		X				X	X	X	X	X	X	X		X	X		X	X
66		X				X	X	X	X	X	X	X		X	X		X	X
67			X			X	X	X	X	X	X	X		X	X		X	X
68			X			X	X	X	X	X	X	X		X	X		X	X
69			X			X	X	X	X	X	X	X		X	X		X	X
70			X			X	X	X	X	X	X	X		X	X		X	X
71			X			X	X	X	X	X	X	X		X	X		X	X
72			X			X	X	X	X	X	X	X		X	X		X	X
73			X			X	X	X	X	X	X	X		X	X		X	X
74			X			X	X	X	X	X	X	X		X	X		X	X
75			X			X	X	X	X	X	X	X		X	X		X	X
76			X			X	X	X	X	X	X	X		X	X		X	X
77			X			X	X	X	X	X	X	X		X	X		X	X
78			X			X	X	X	X	X	X	X		X	X		X	X
79			X			X	X	X	X	X	X	X		X	X		X	X
80			X			X	X	X	X	X	X	X		X	X		X	X
81			X			X	X	X	X	X	X	X		X	X		X	X
82			X			X	X	X	X	X	X	X		X	X		X	X
83			X	X			X	X	X	X	X	X	X	X	X		X	X
84			X	X			X	X	X	X	X	X	X	X	X		X	X
85			X	X			X	X	X	X	X	X	X	X	X		X	X
86			X		X		X	X	X	X	X	X	X	X	X		X	X
87			X		X		X	X	X	X	X	X	X	X	X		X	X
88			X		X		X	X	X	X	X	X	X	X	X		X	X

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NON-OPTIMIZED PLANING OF A WORK PIECE

Fig 30

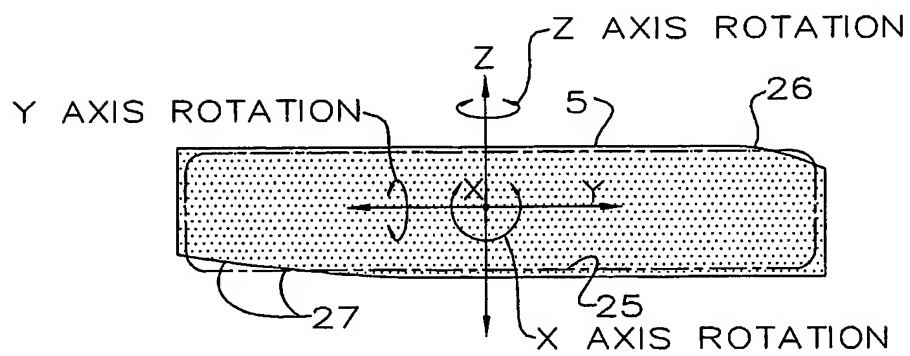
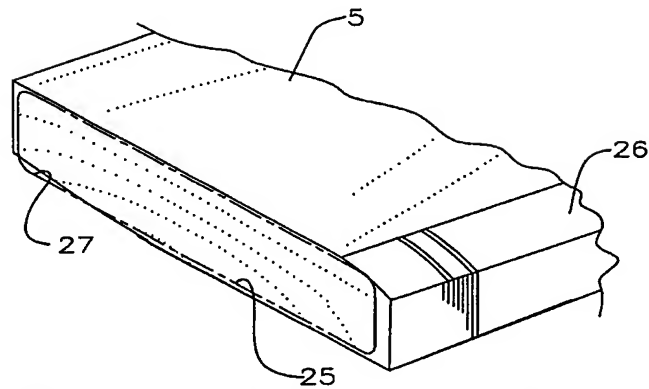


Fig 31

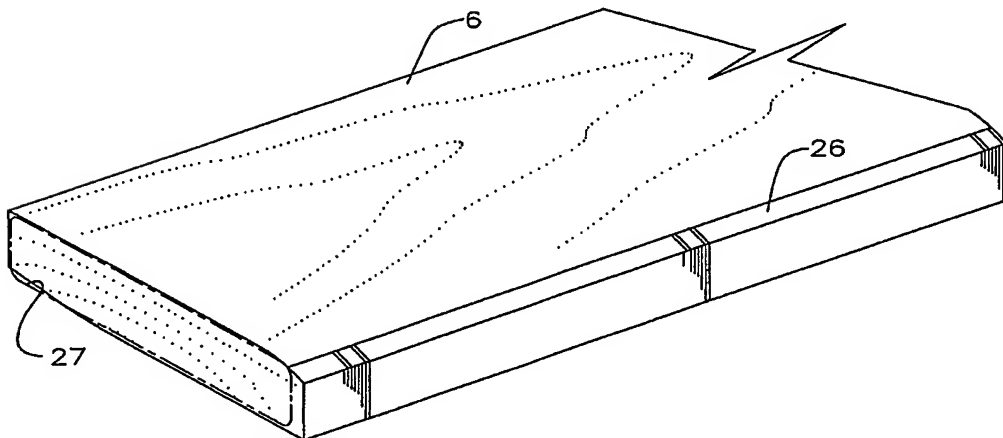
NON-OPTIMIZED PLANING OF A WORK PIECE

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NON-OPTIMIZED PLANING OF A WORK PIECE

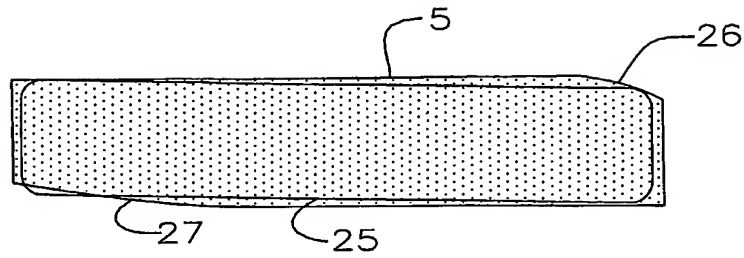
Fig 32



NON-OPTIMIZED PLANING OF A WORK PIECE

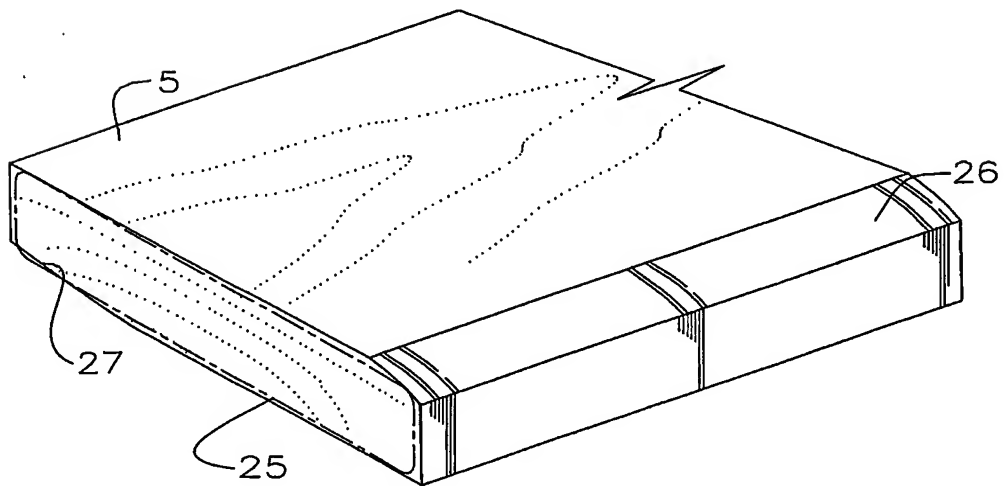
Fig 33

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OPTIMIZED PLANING OF A WORK PIECE

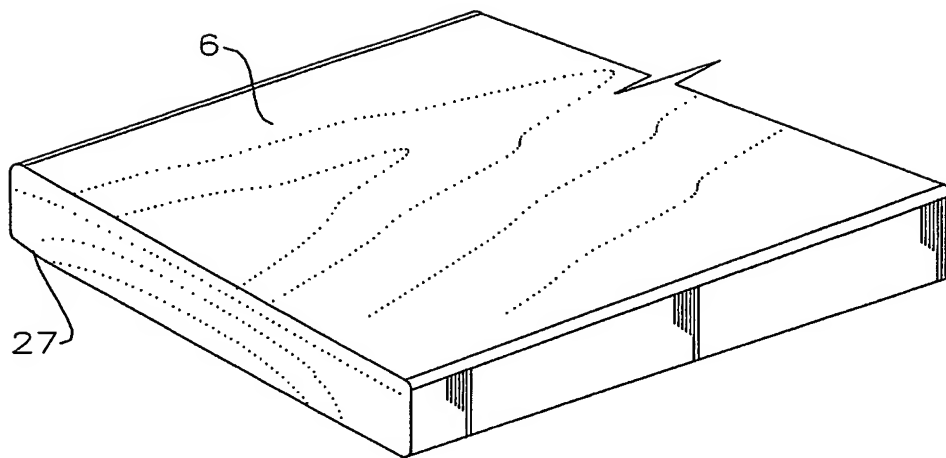
Fig 34



OPTIMIZED PLANING OF A WORK PIECE

Fig 35

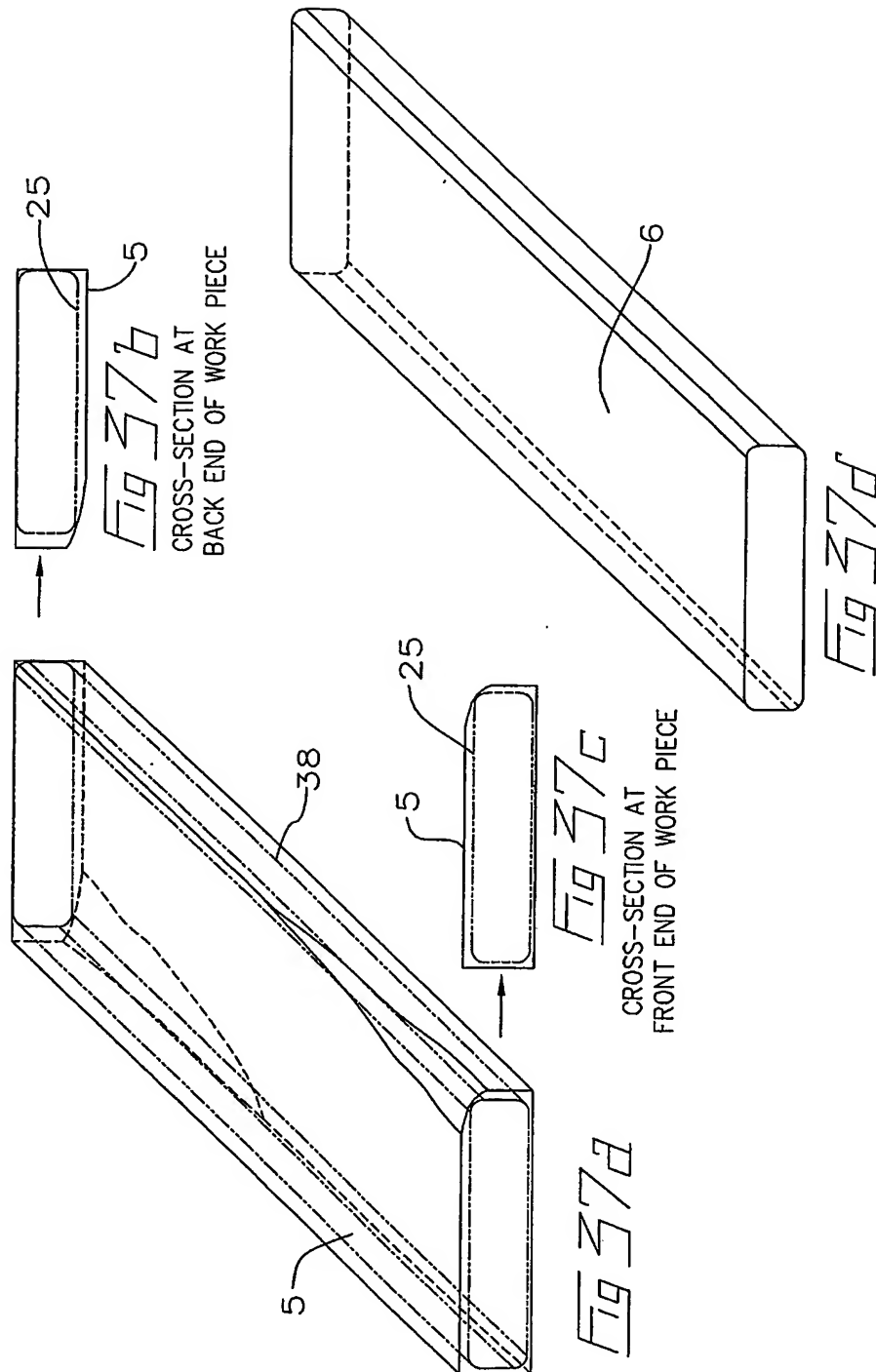
30/55



OPTIMIZED PLANING OF A WORK PIECE

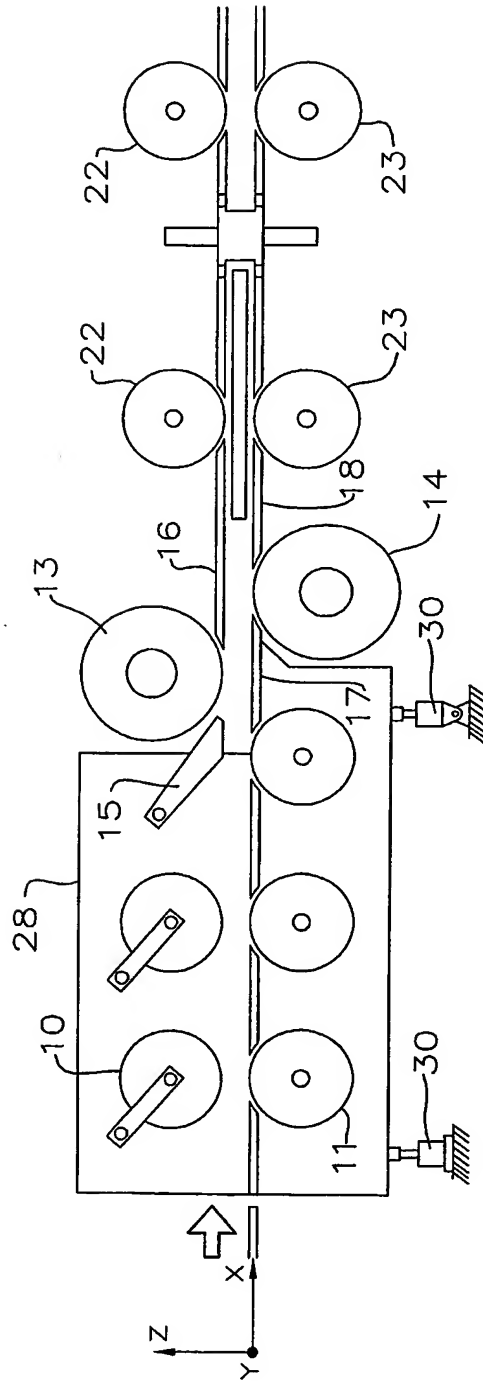
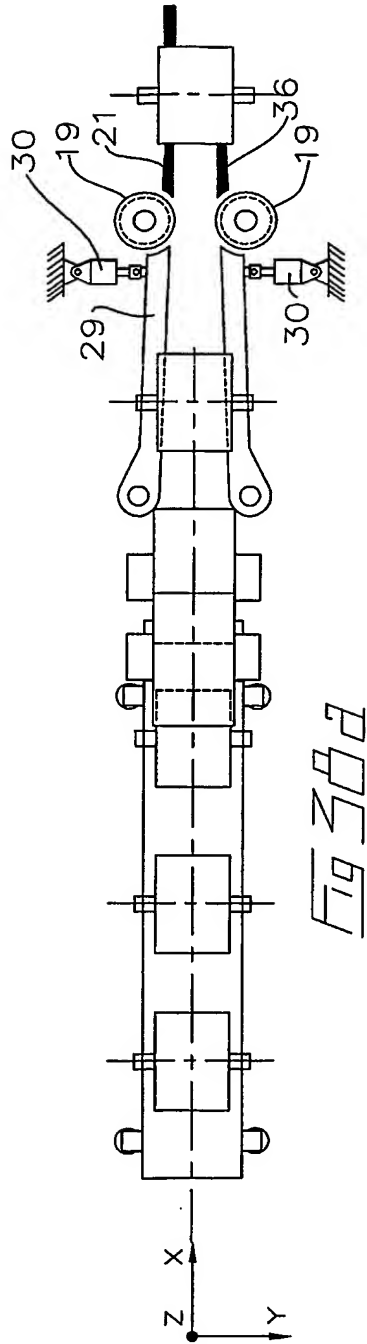
Fig 36

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EXAMPLE OF OPTIMIZED PLANING OF A WORK PIECE WITH WANE DEFECTS

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OPTIMIZING PLANER-THREE AXIS INFED POSITIONING MODULE WITH INTERMEDIATE SIDE HEAD STEERING

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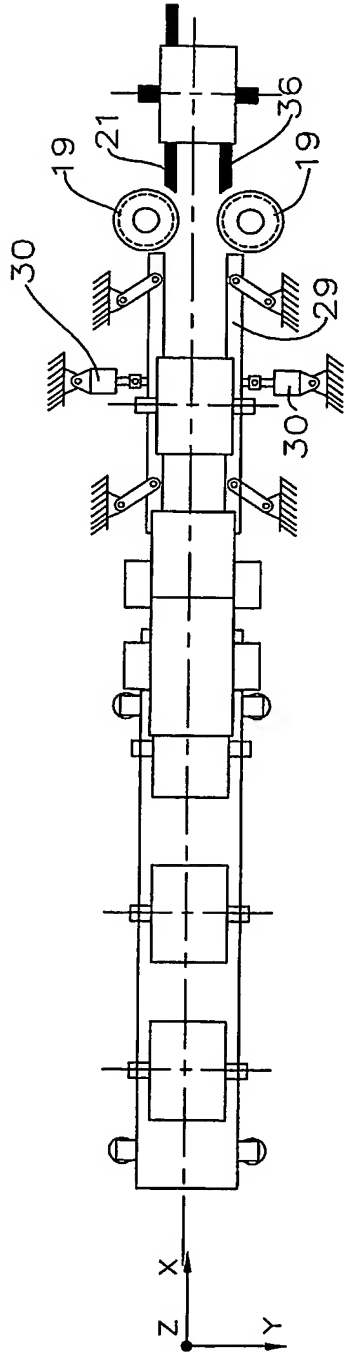


Fig 39a

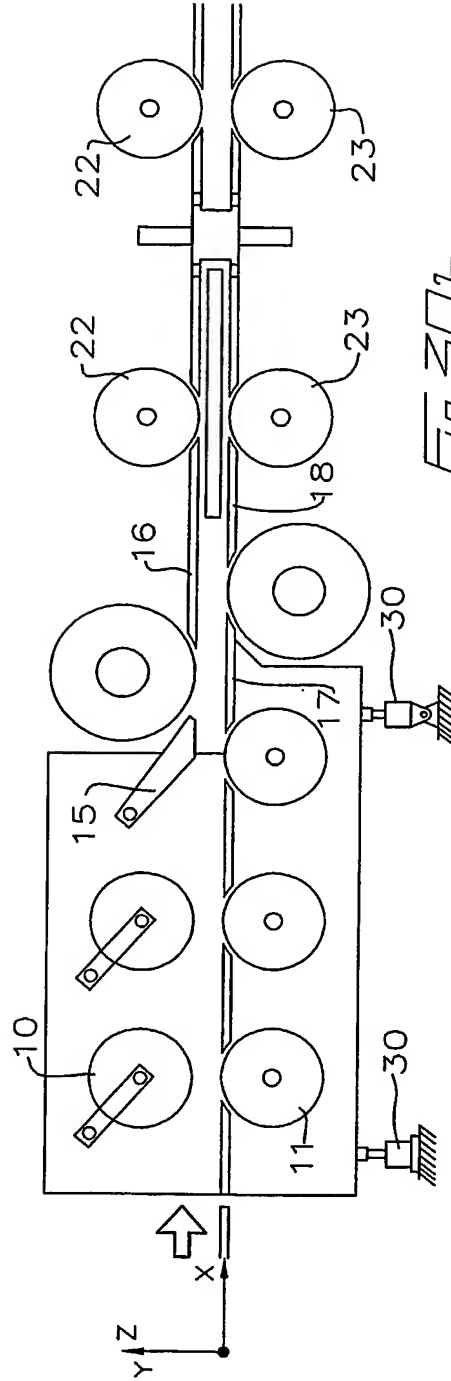
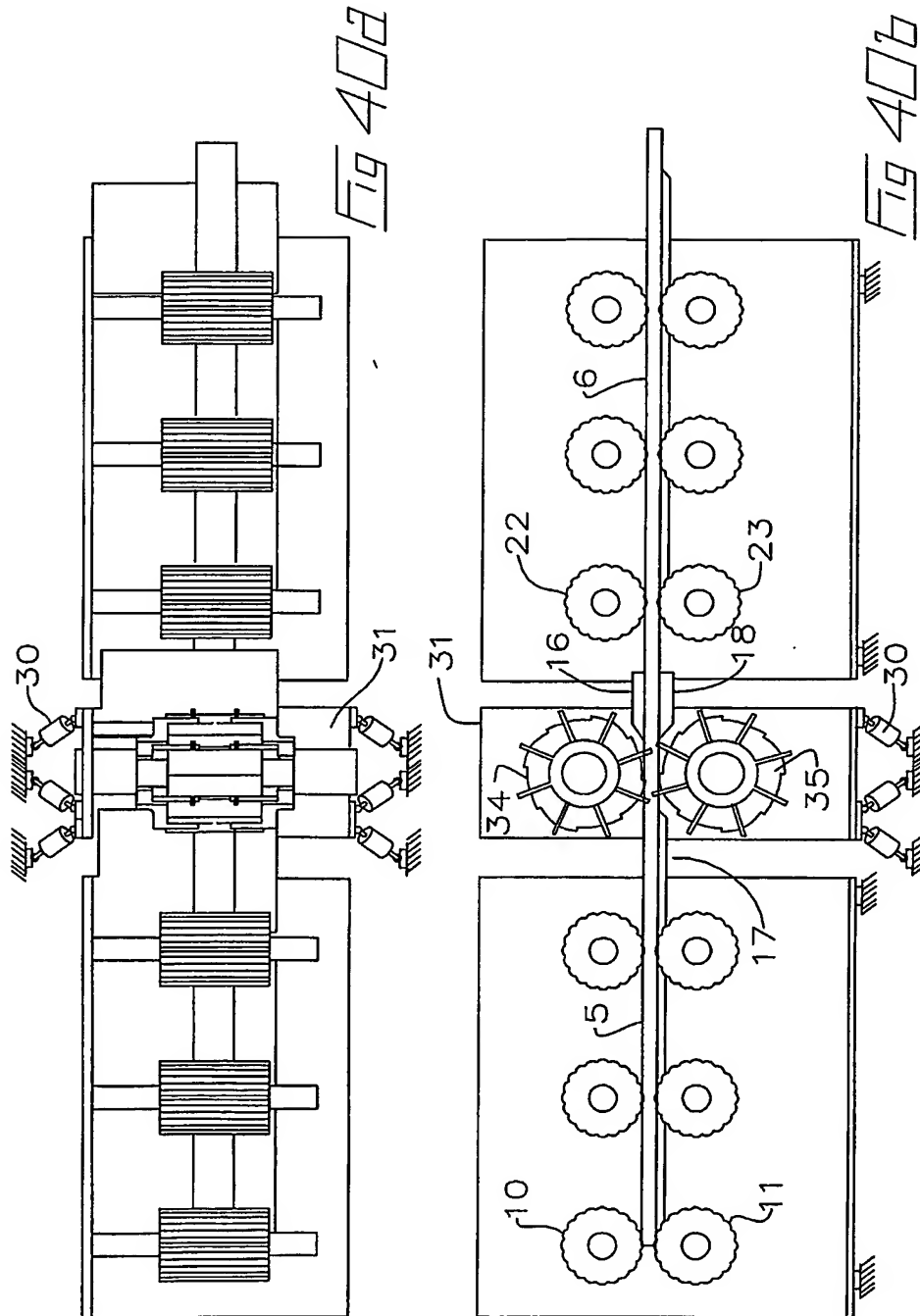


Fig 39b

OPTIMIZING PLANNER-THREE AXIS INFED POSITIONING MODULE WITH PARALLEL INTERMEDIATE SIDE HEAD STEERING

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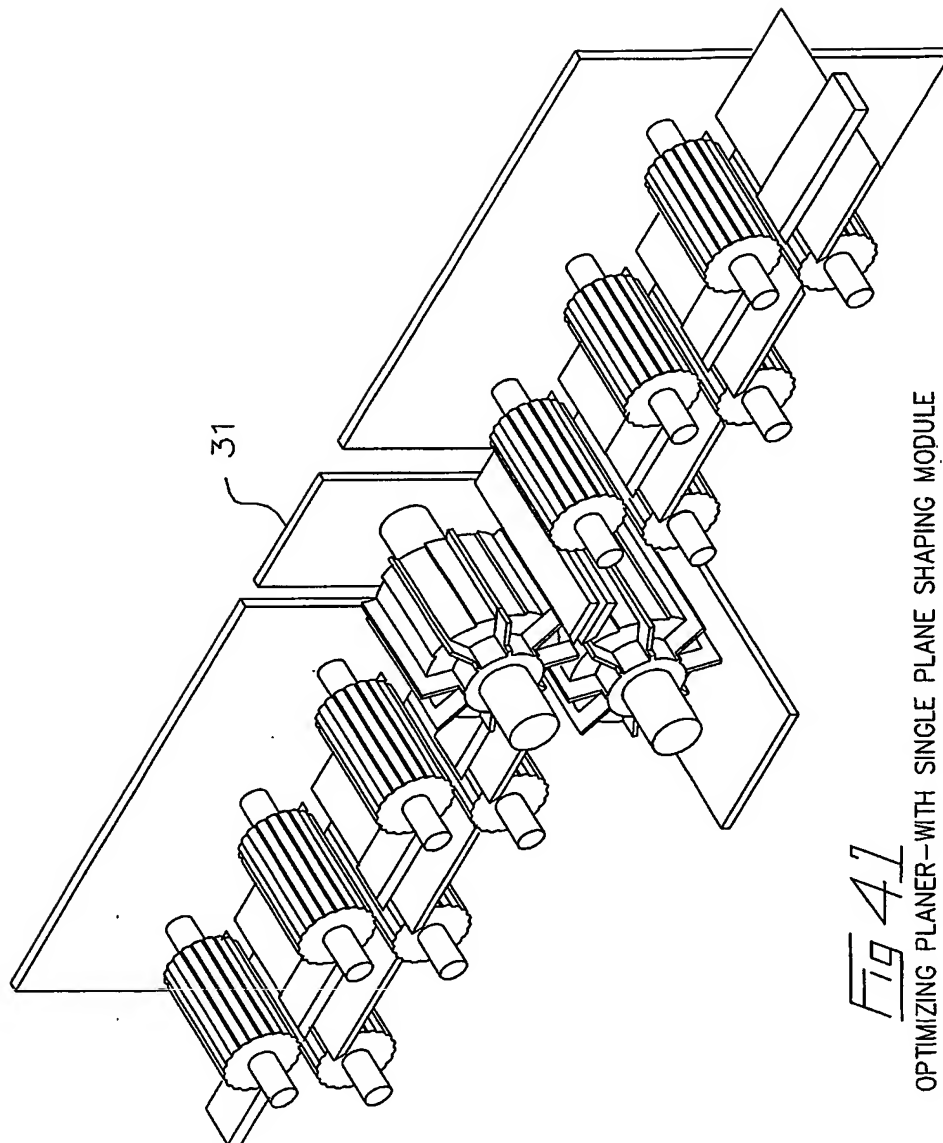
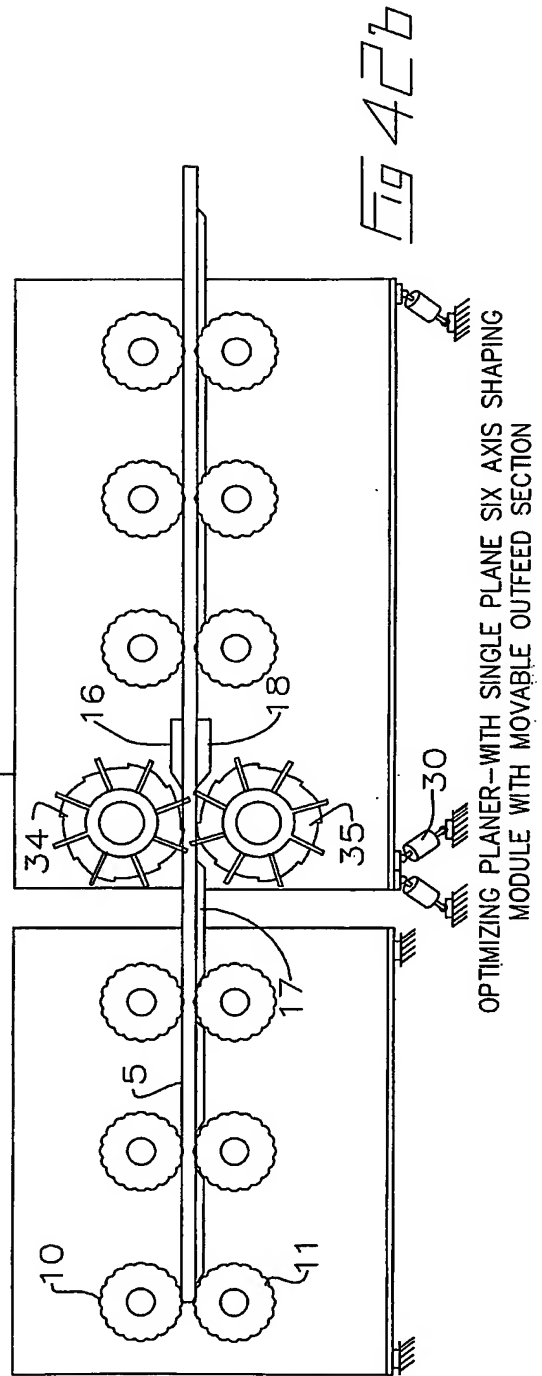
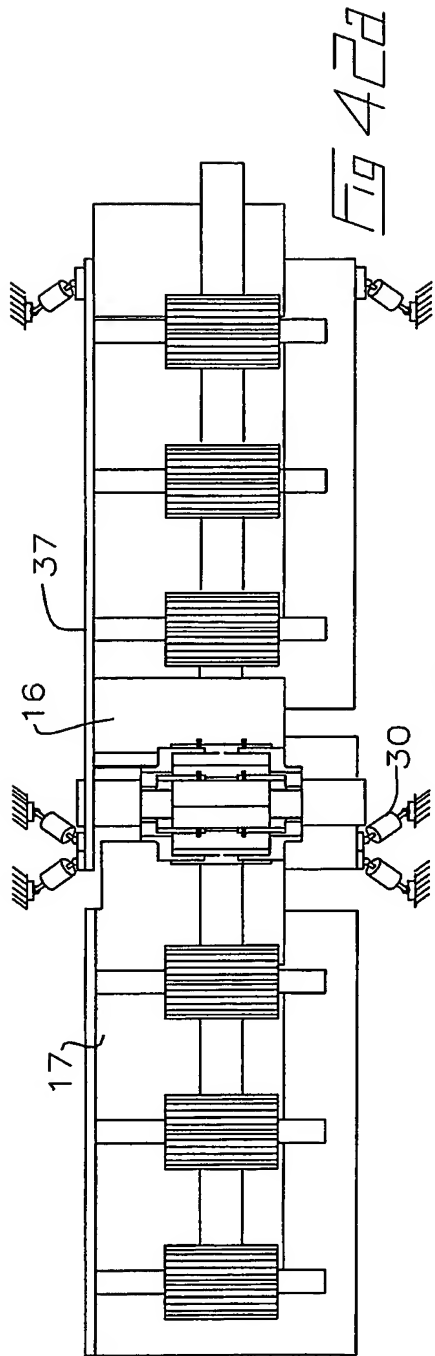


Fig 41
OPTIMIZING PLANER—WITH SINGLE PLANE SHAPING MODULE

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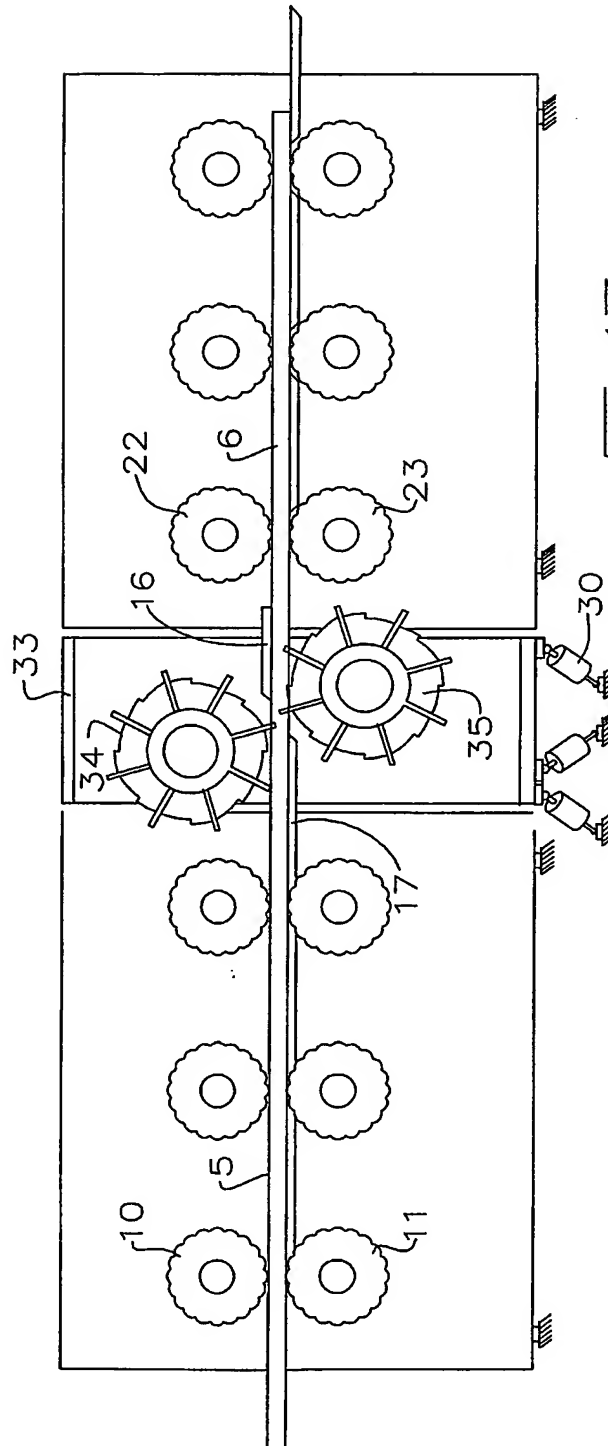


Fig 43

OPTIMIZING PLANER- WITH OFFSET PLANER HEAD SIX AXIS SHAPING MODULE

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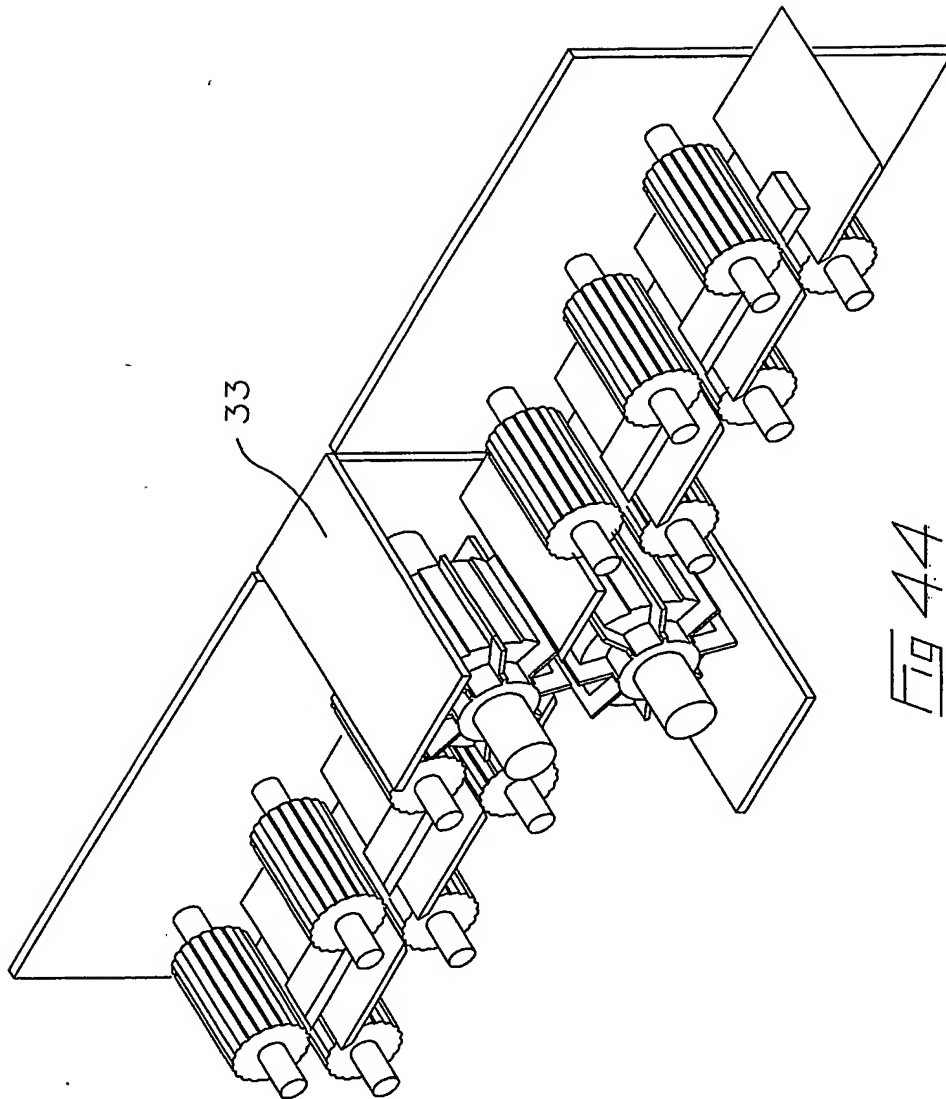
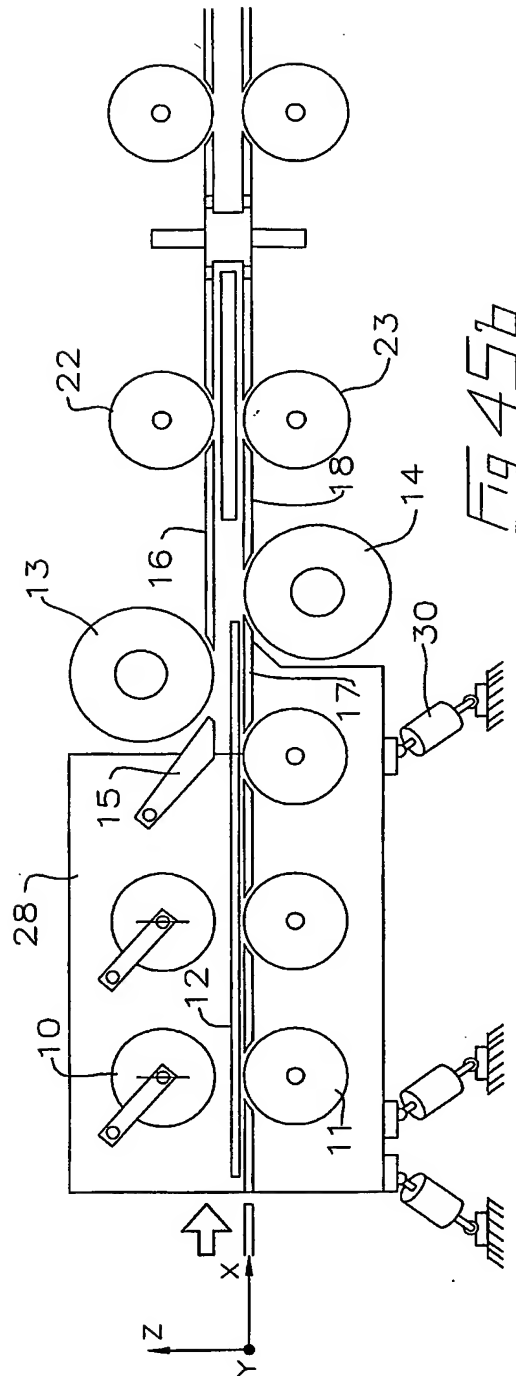
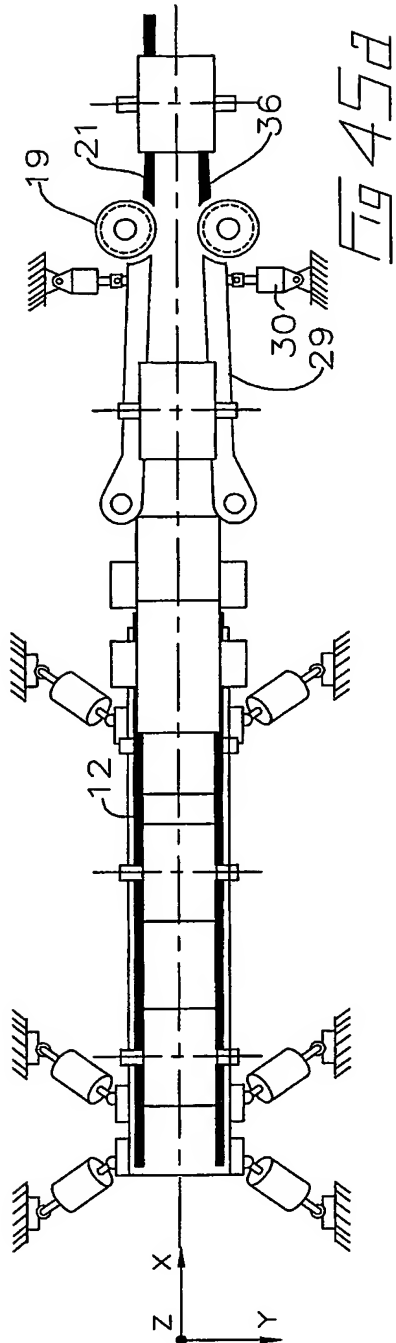


Fig 44

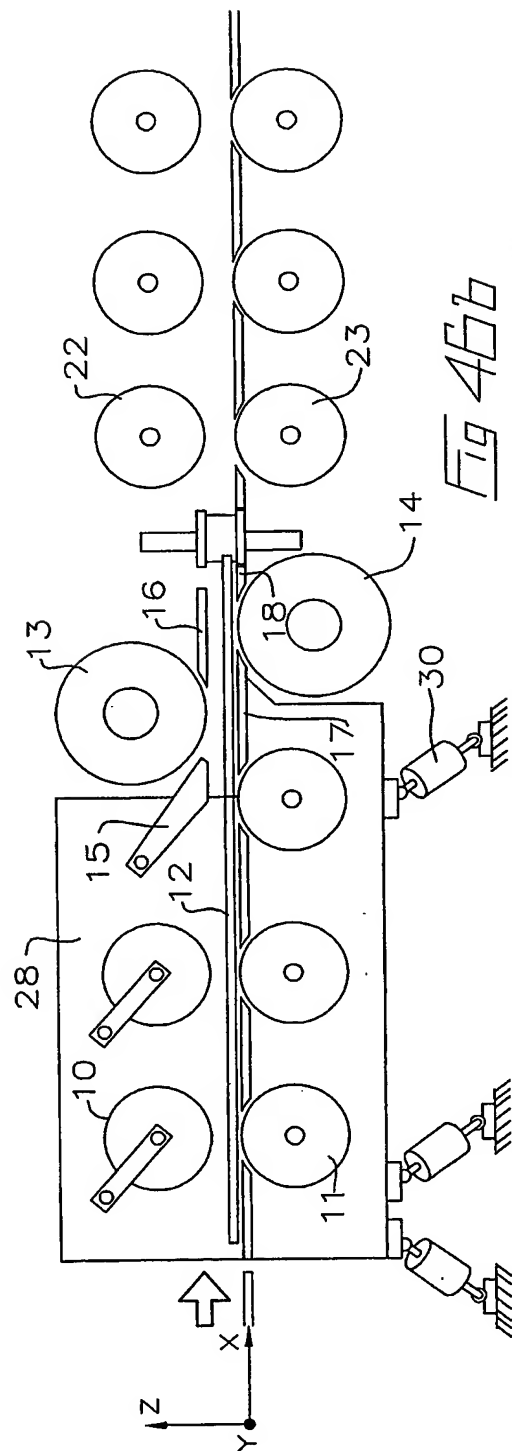
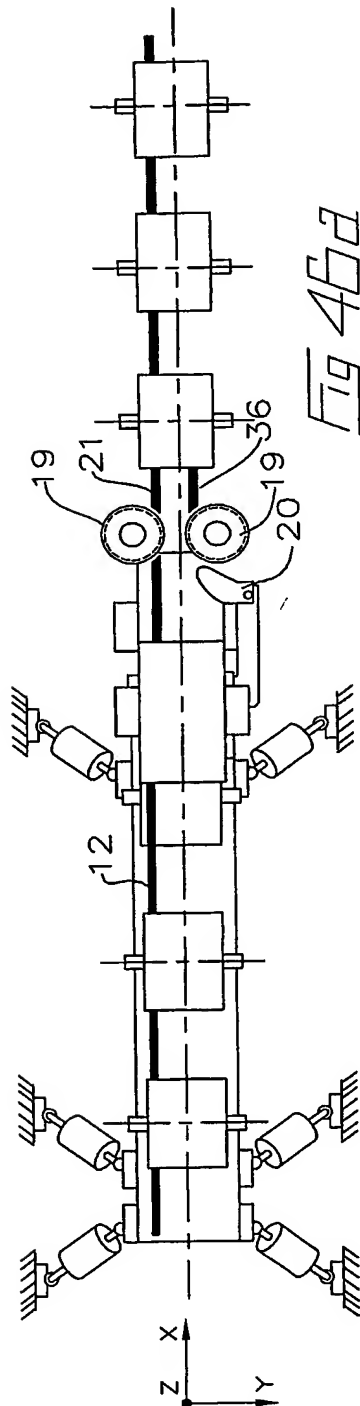
OPTIMIZING PLANER—WITH OFFSET PLANER HEAD SIX AXIS SHAPING MODULE

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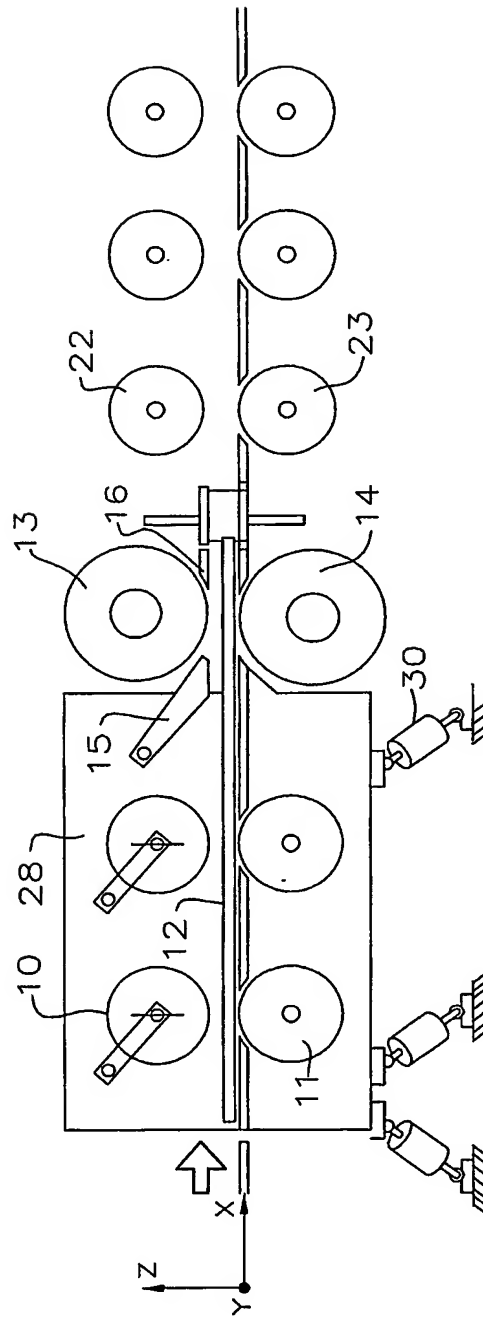
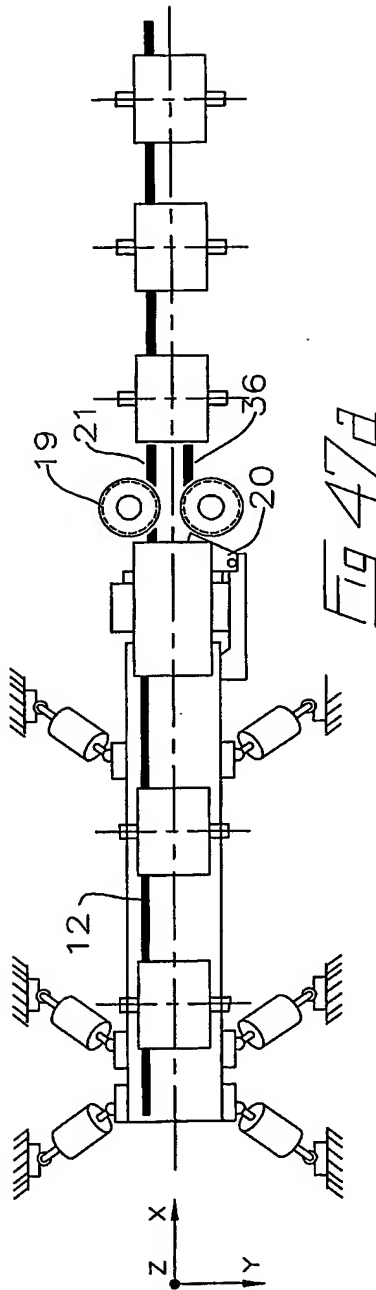
OPTIMIZING PLANNER WITH SIX AXIS INFEEED POSITIONING MODULE AND INTERMEDIATE SIDE STEERING MODULE

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OPTIMIZING PLANER WITH SIX AXIS INFED POSITIONING MODULE(OFFSET TOP AND BOTTOM HEADS)

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OPTIMIZING PLANER WITH SIX AXIS INFEEED POSITIONING MODULE (INLINE TOP AND BOTTOM HEADS)

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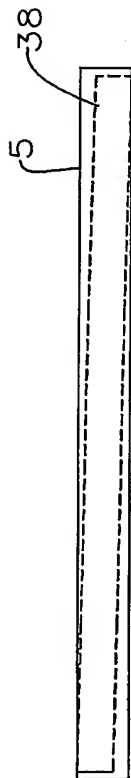


Fig 40a
TOP VIEW OF ROUGH WORK PIECE

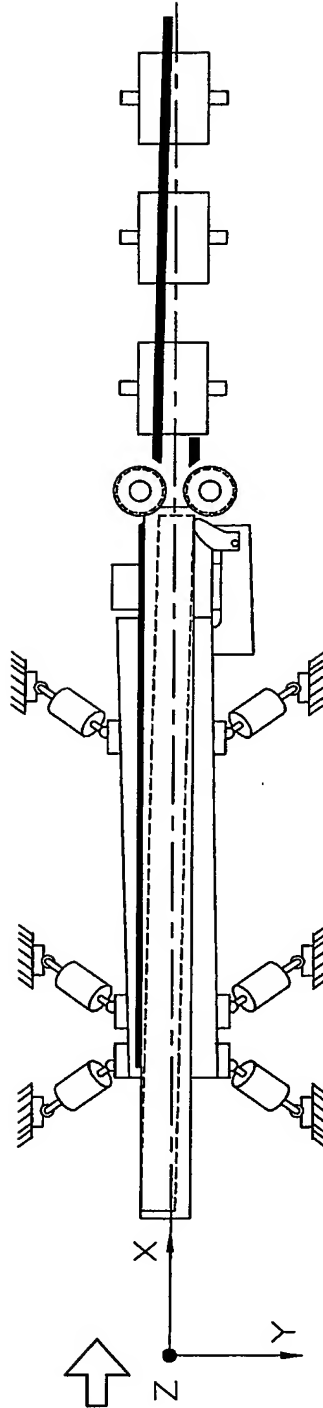


Fig 40
OPTIMIZED PLANER-FEEDING EXAMPLE(TOP VIEW)

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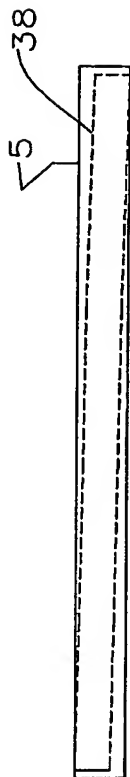


Fig 49a

SIDE VIEW OF ROUGH WORK PIECE

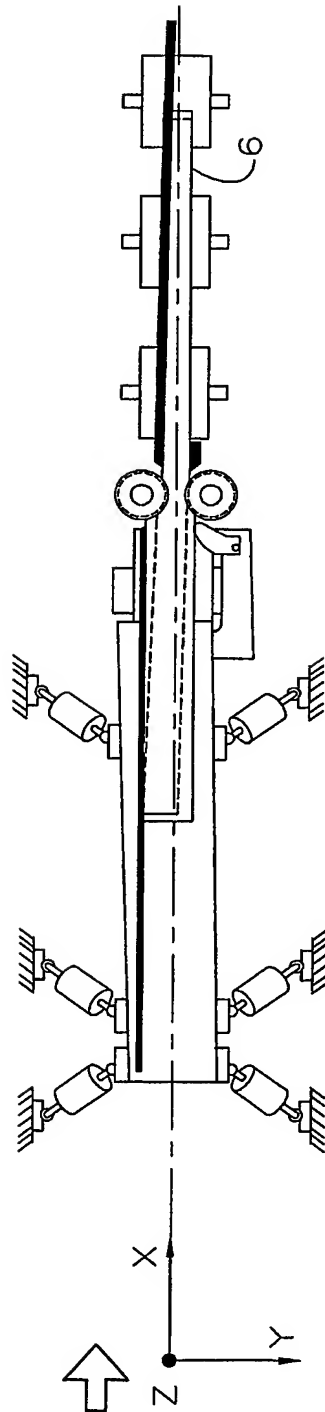


Fig 49

OPTIMIZED PLANER-FEEDING EXAMPLE(TOP VIEW)

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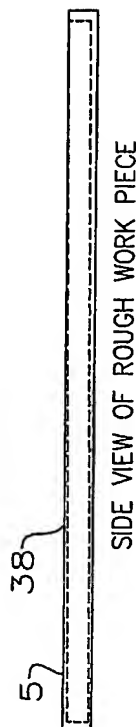


Fig 50a

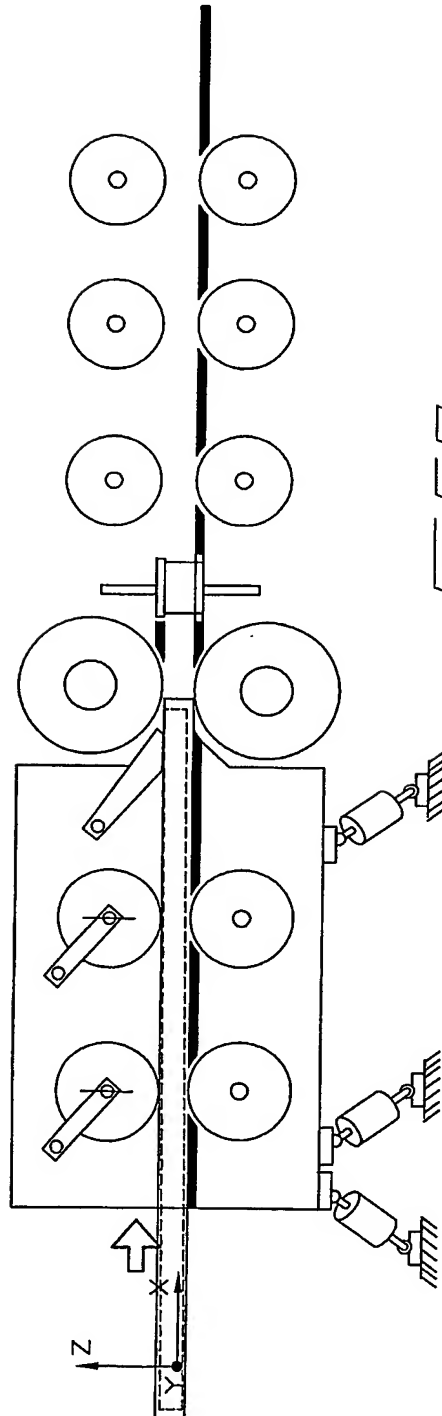
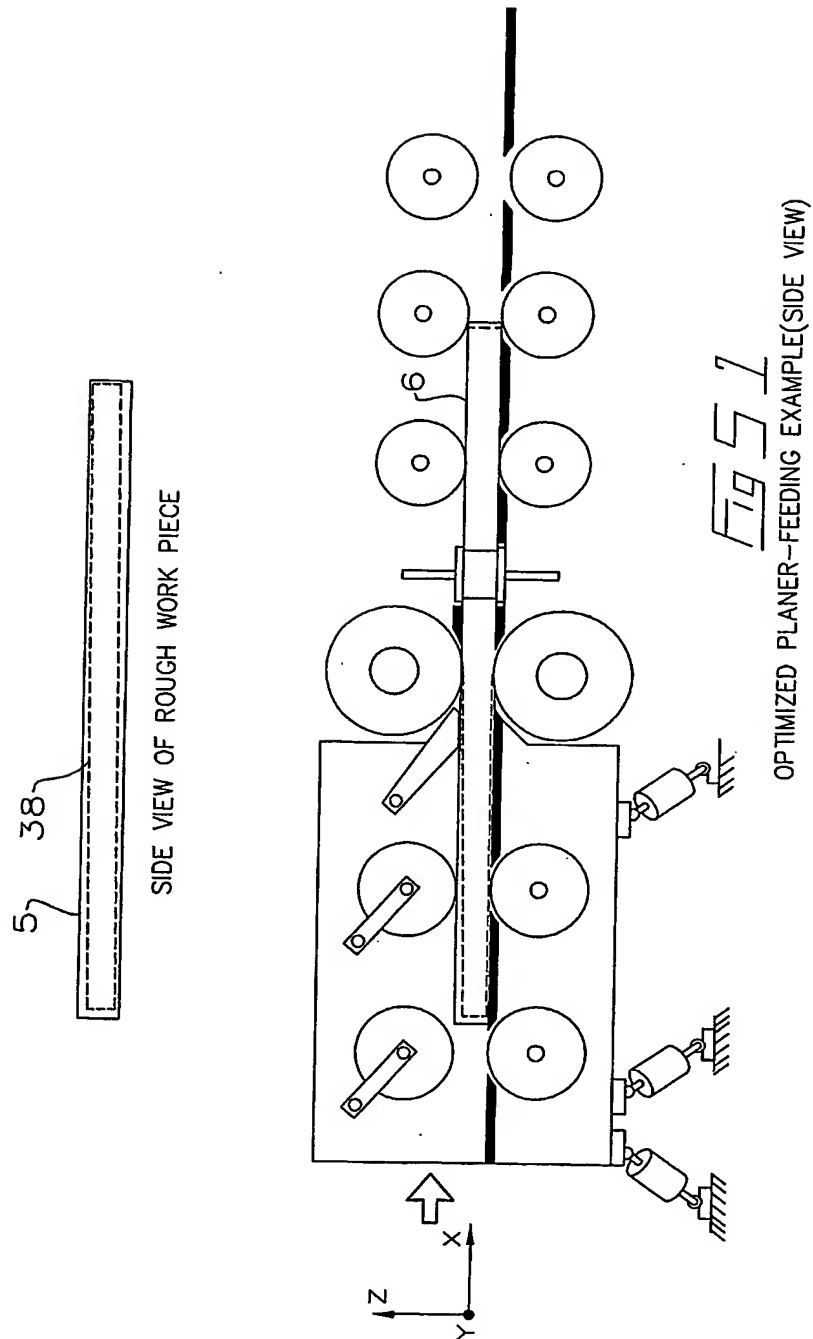
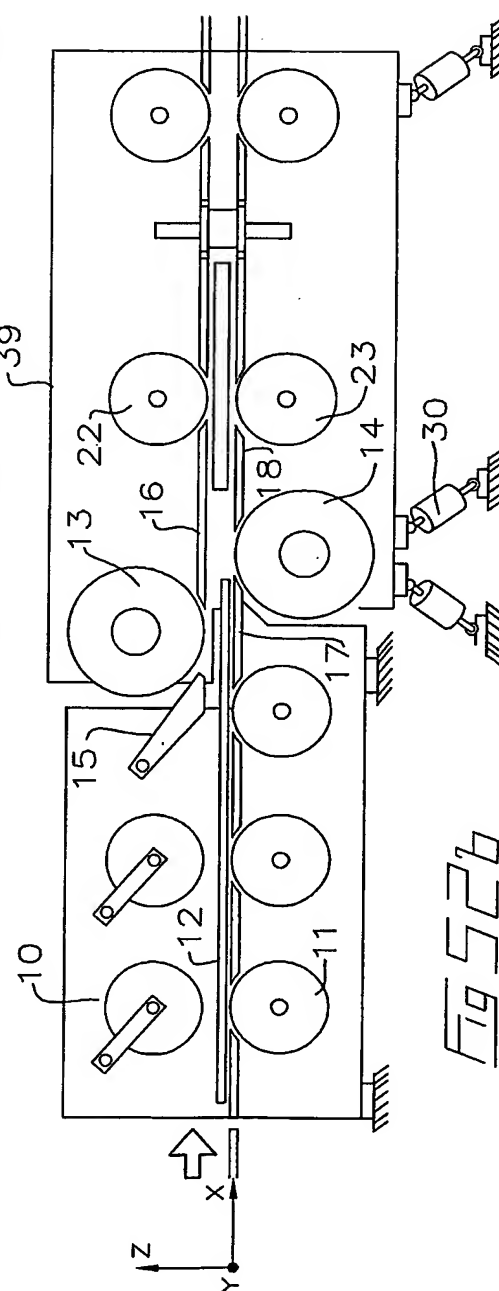
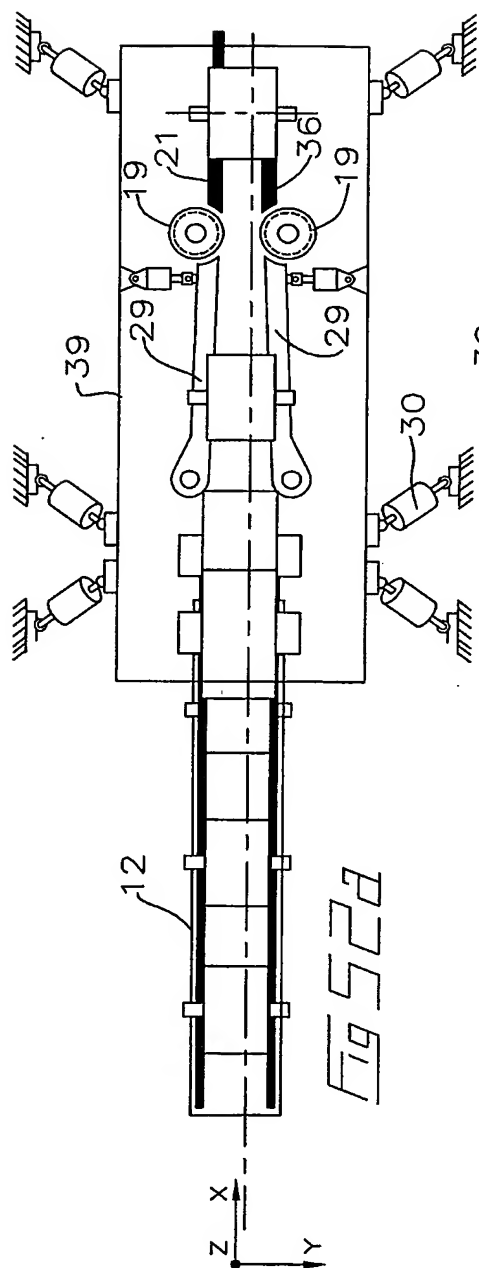


Fig 50

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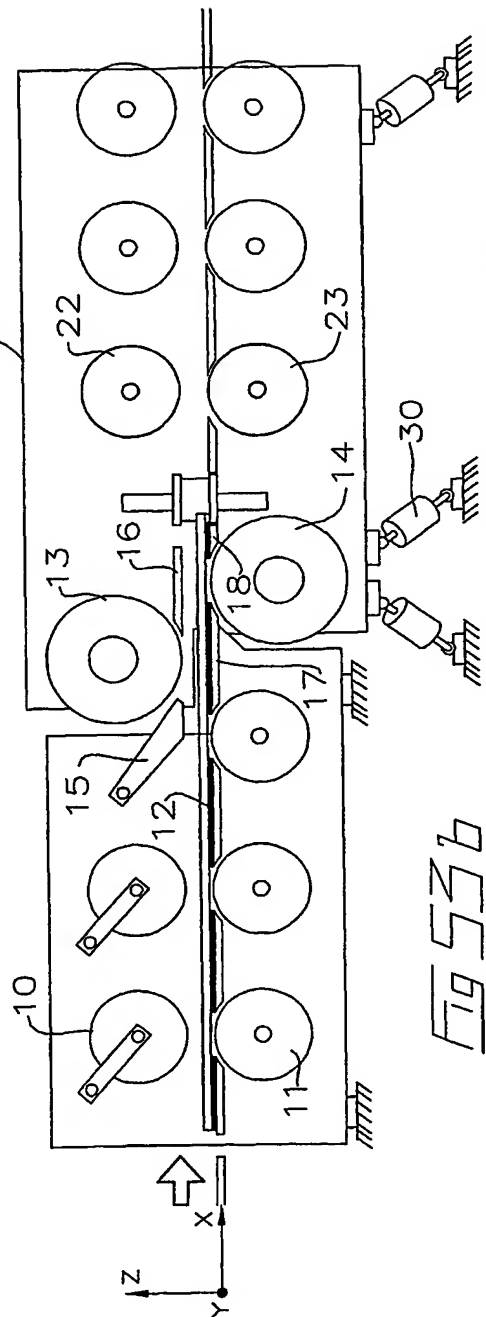
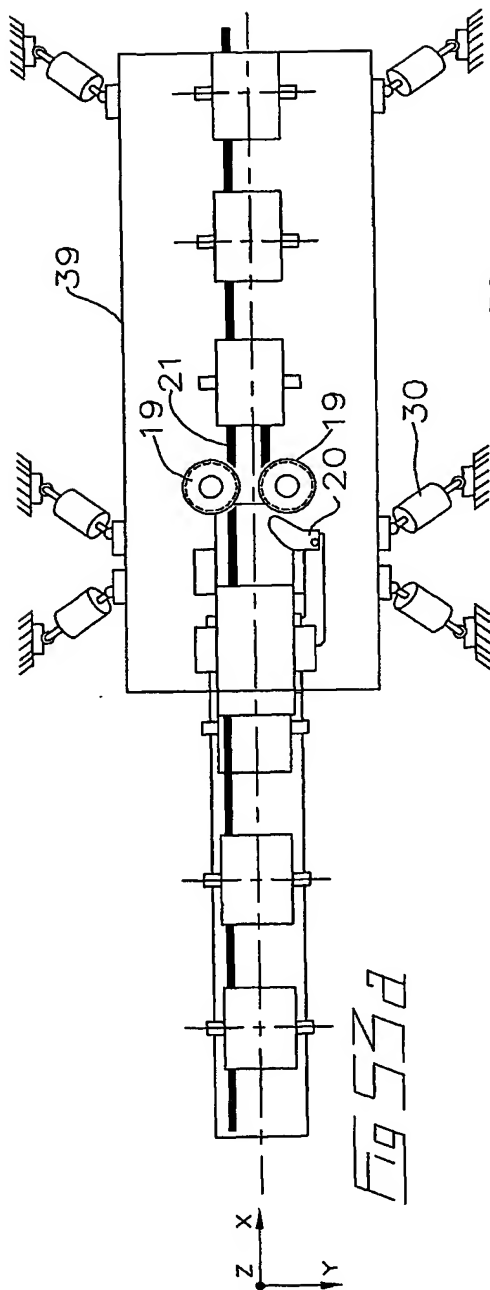


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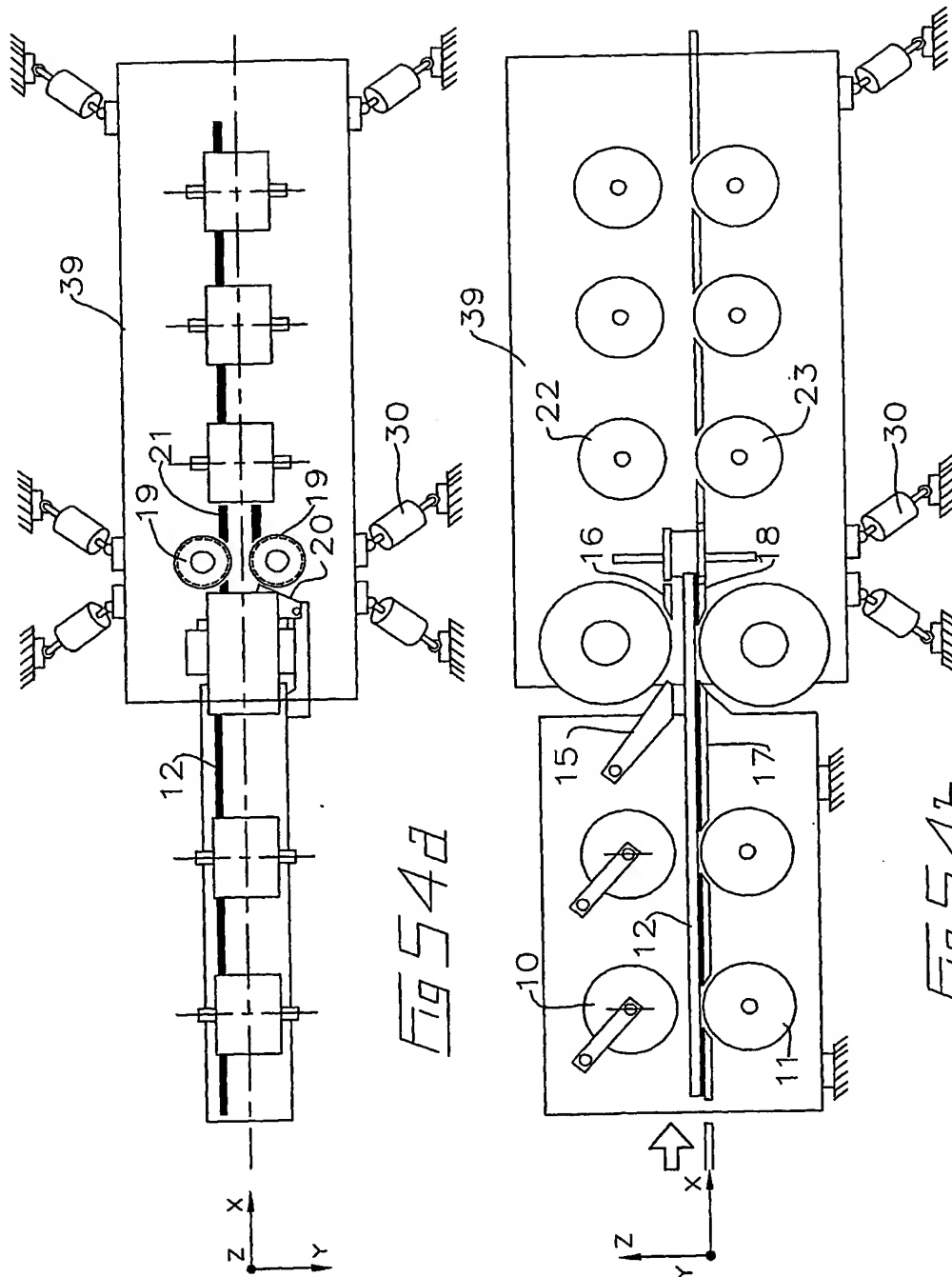
OPTIMIZING PLANER WITH SIX AXIS OUTFEED POSITIONING MODULE AND INTERMEDIATE SIDE STEERING MODULE

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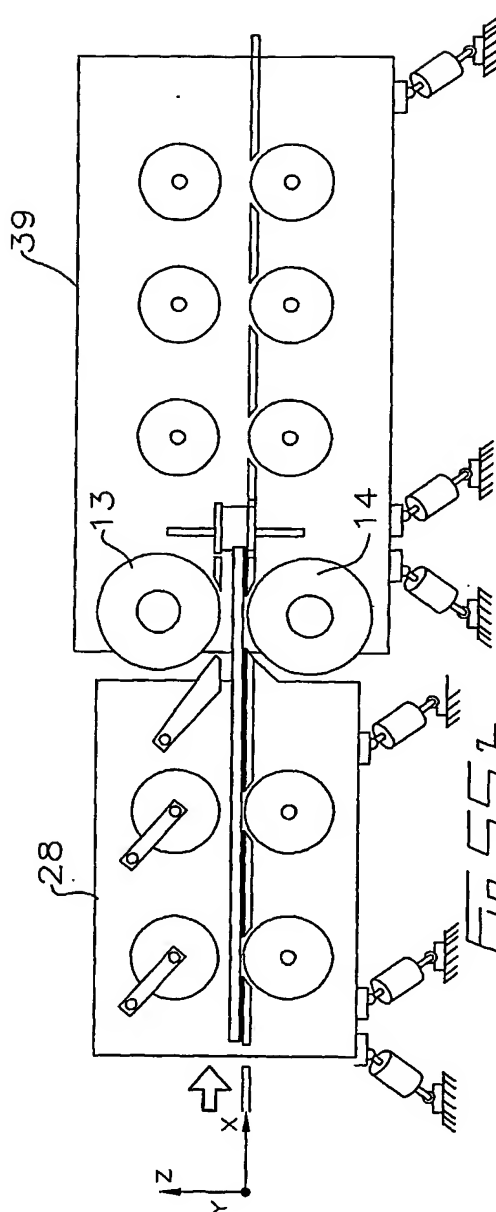
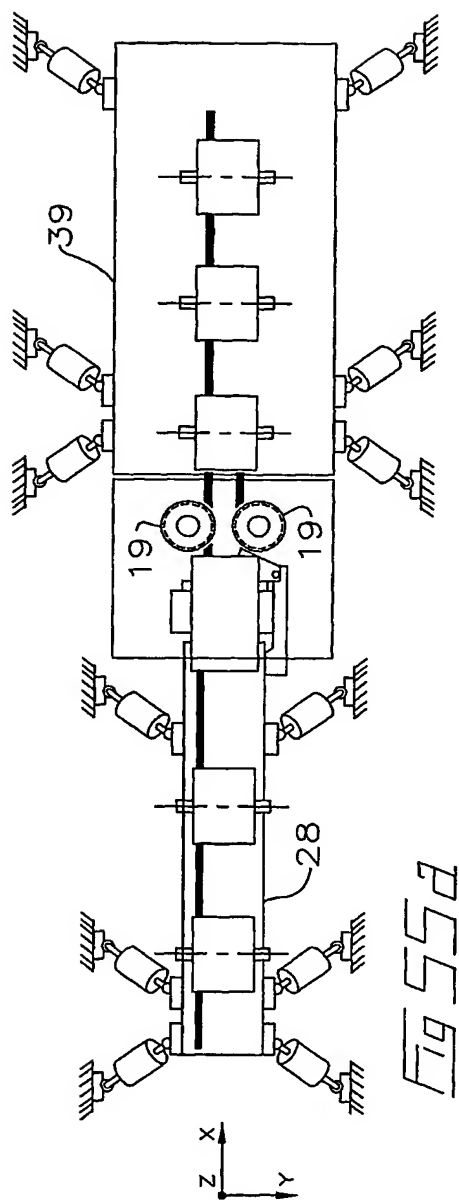
OPTIMIZING PLANER WITH SIX AXIS OUTFEED POSITIONING MODULE WITH OFFSET MAIN PLANER HEADS

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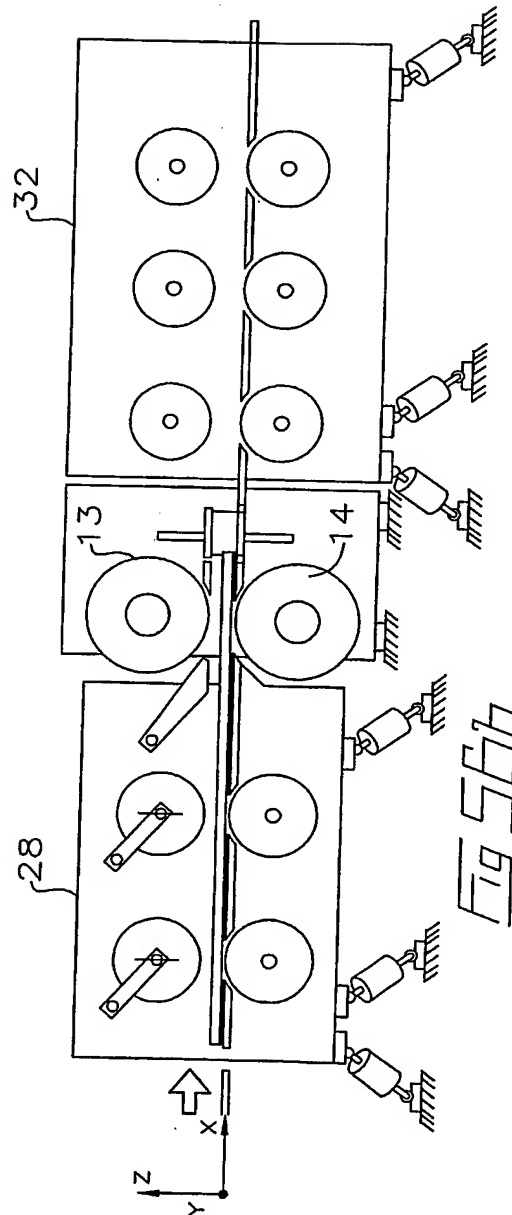
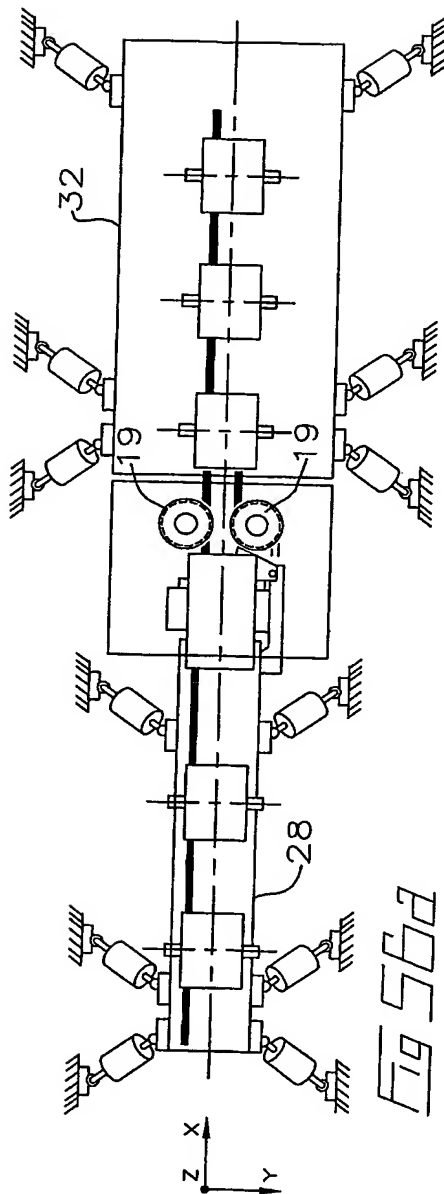
OPTIMIZING PLANER WITH SIX AXIS OUTFEED POSITIONING MODULE WITH INLINE MAIN PLANER HEADS

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OPTIMIZING PLANNER WITH SIX AXIS INFED AND OUTFEED POSITIONING MODULES (HEADS MOVING WITH OUTFEED)

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OPTIMIZING PLANNER WITH SIX AXIS INFEEED AND OUTFEED POSITIONING MODULES (STATIONARY HEADS)

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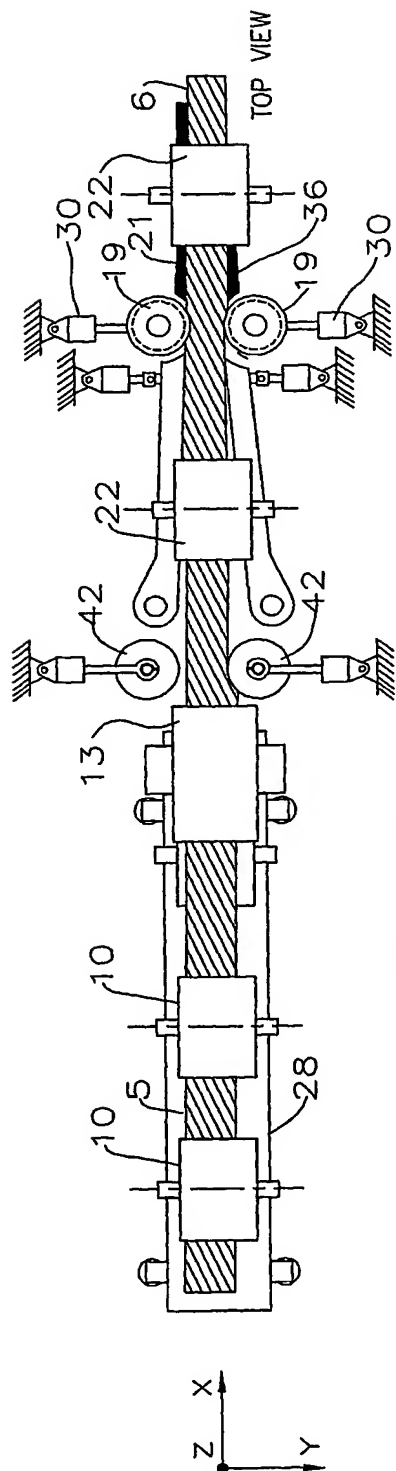


Fig 57
OPTIMIZING PLANER—OPTIONAL SIDE PRE-CUT
(TO REDUCE WORK PIECE TO A SMALLER NOMINAL SIZE)

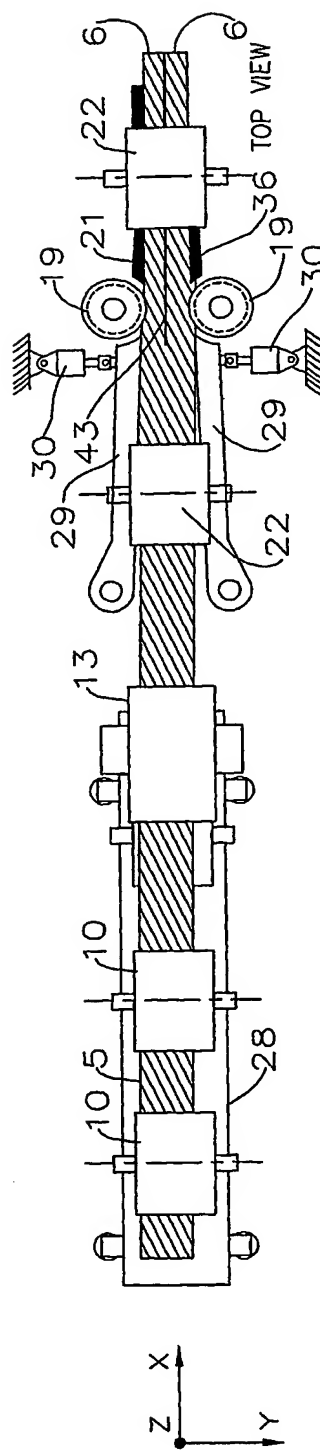


Fig 58
OPTIMIZING PLANER—OPTIONAL INTERIOR PROFILING
(TO SPLIT SINGLE WORK PIECE INTO TWO PIECES)

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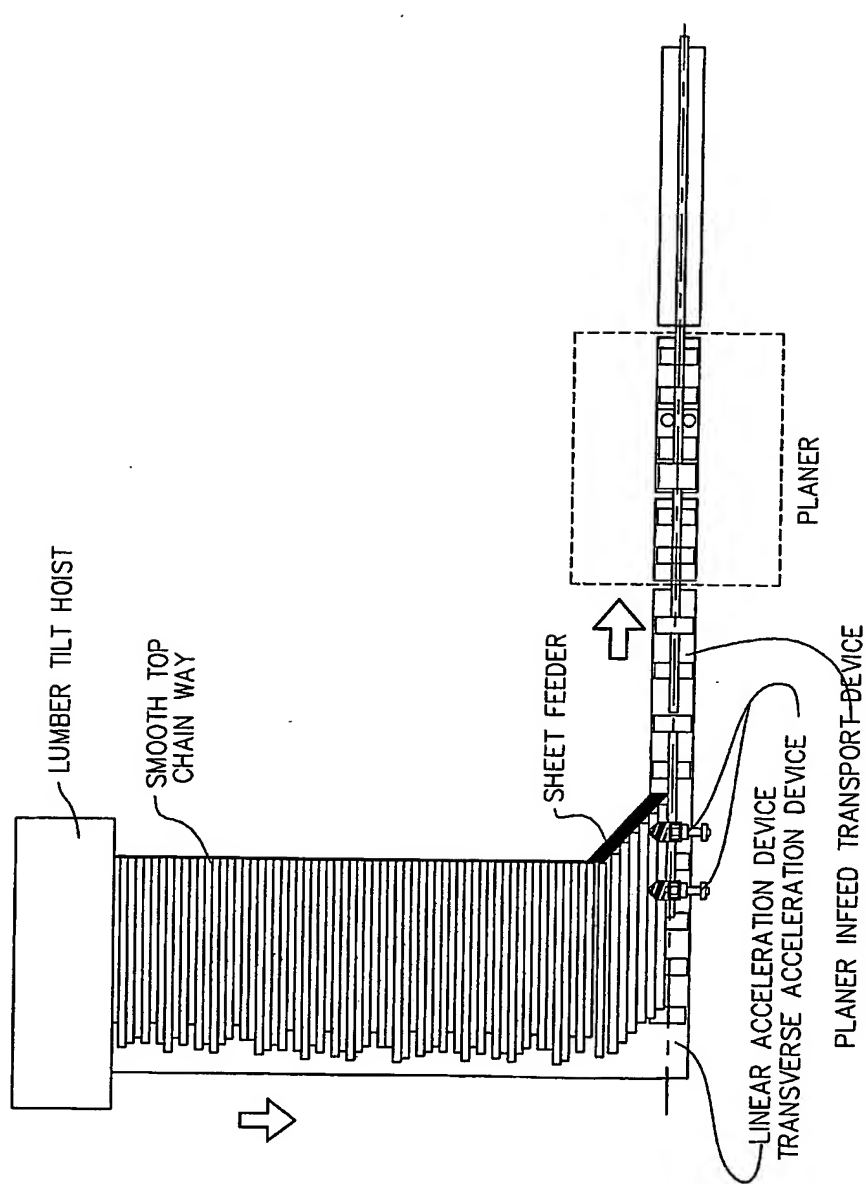


Fig 59

CONVENTIONAL PLANER INFED SYSTEM—SHORT INFED TRANSPORT DEVICE
(BEFORE CONVERSION TO OPTIMIZED SYSTEM)

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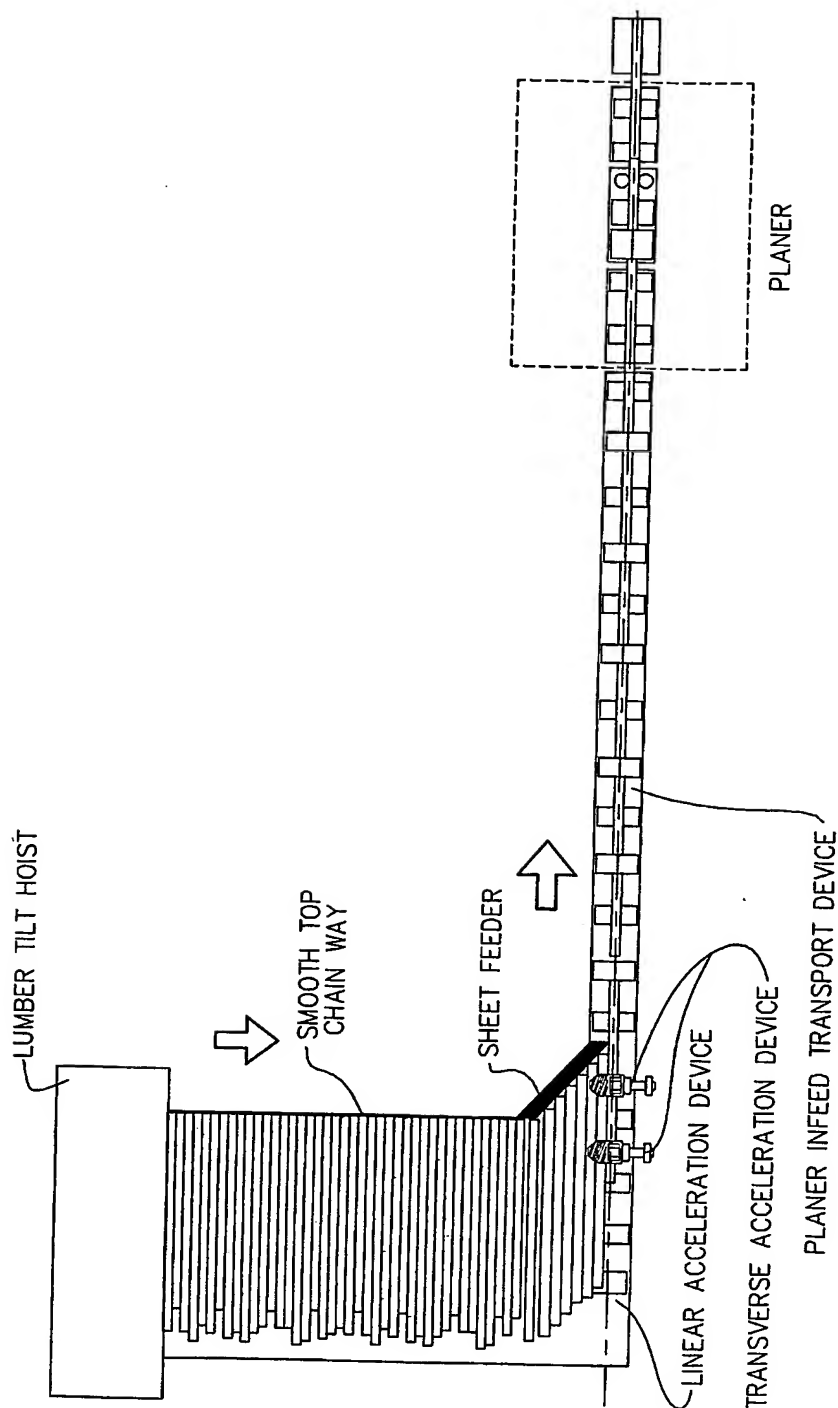


Fig 60

CONVENTIONAL PLANER INFED SYSTEM—LONG INFED TRANSPORT DEVICE
(BEFORE CONVERSION TO OPTIMIZED SYSTEM)

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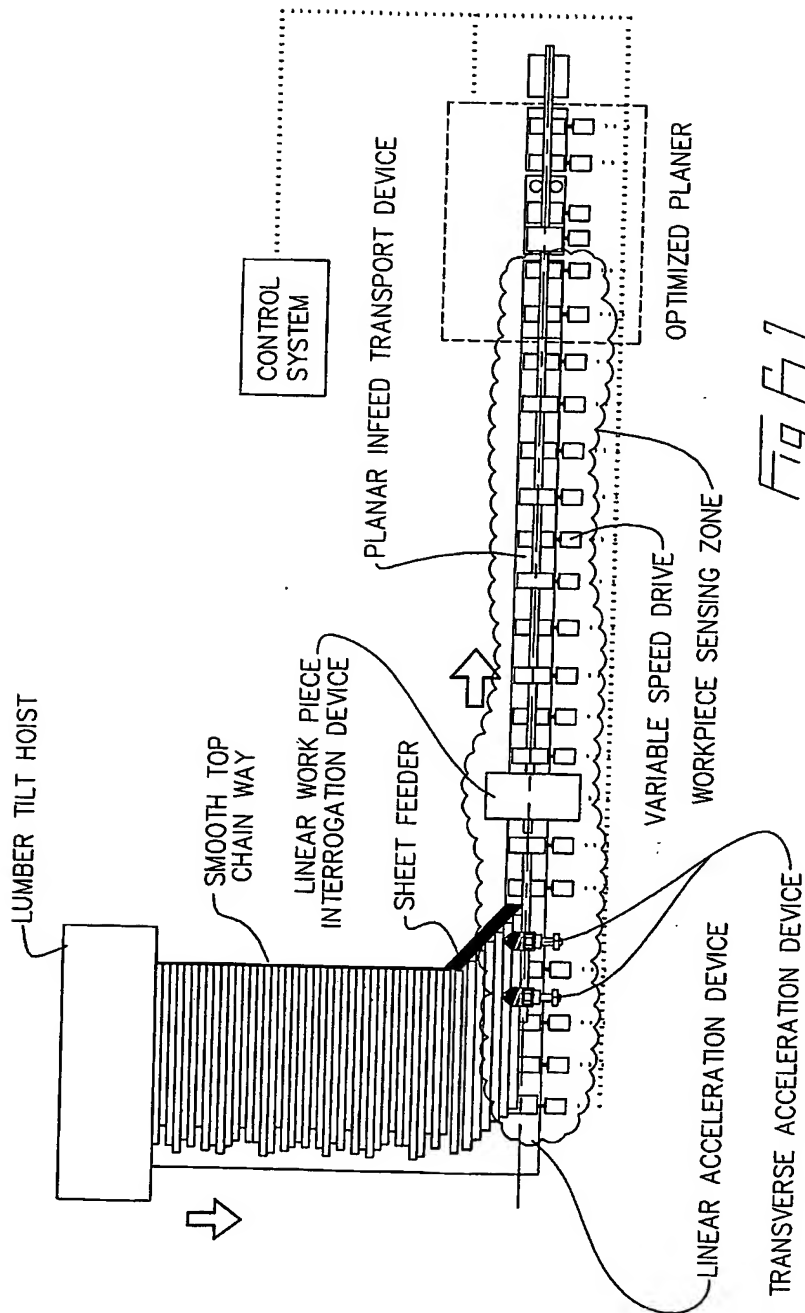


Fig 61

CONVENTIONAL PLANER INFEED SYSTEM—LONG INFEED TRANSPORT DEVICE
(AFTER CONVERSION TO OPTIMIZED SYSTEM)

